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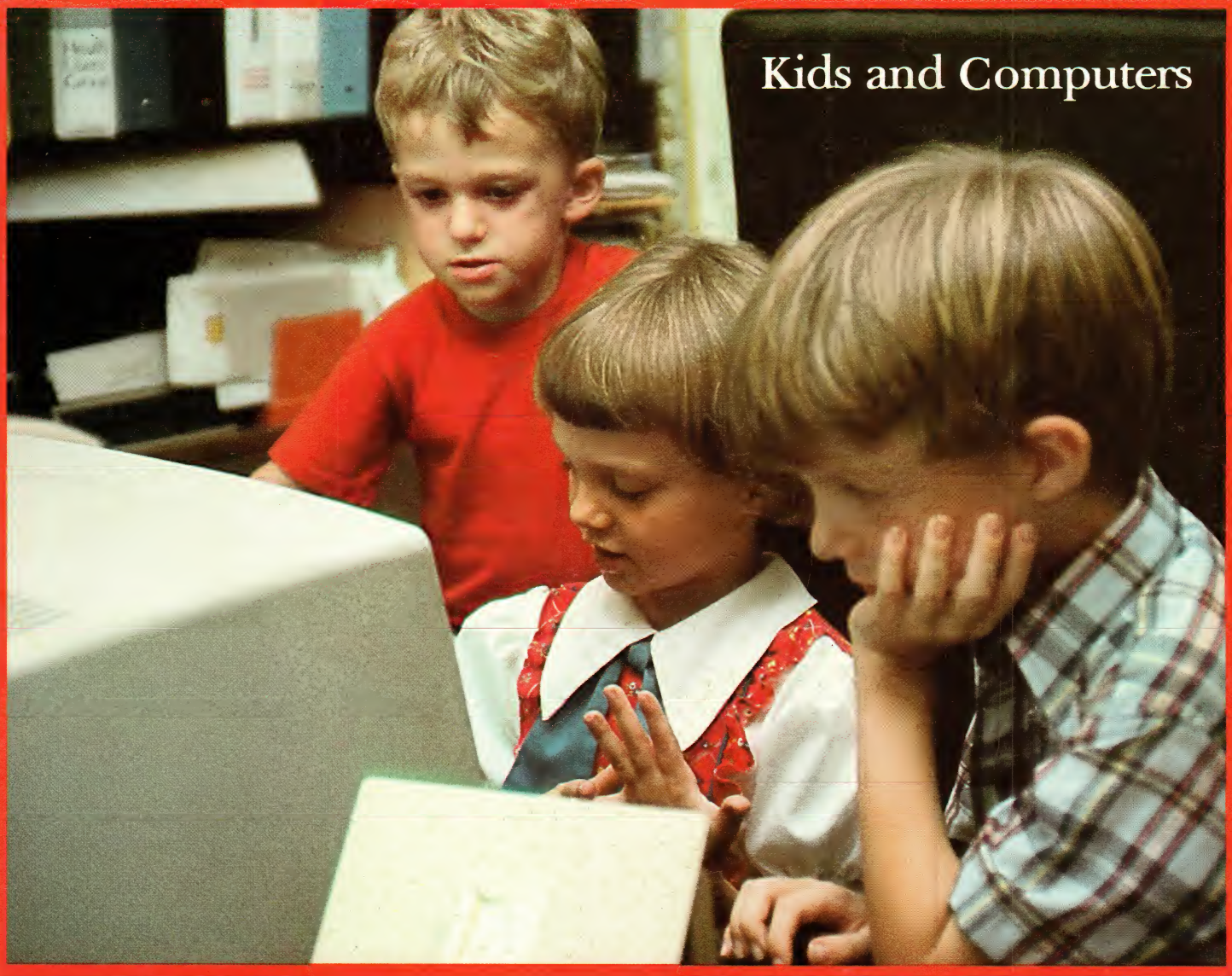
Winter 1984
Issue No. 8

The Independent Magazine for the Entire Zenith Computer Community



Kids and Computers

Software Roundup—Games for Heath/Zenith Computers

Z-DOS Assembly Language—Getting Started

The '89 Goes to College

Two Low-Cost Printers

Users in Uniform

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Before you plunk down your quarters for some new game disk, you may want to take a look at this survey. Our weary reporter played nearly fifty games available for Heath/Zenith computers. He spent hours zapping aliens, tunnelling through caves, and learning spelling, geography, and air-traffic control. Afterwards, he rated the games on a scale of one to five for nine categories—including winnability, graphics, learning value, and the degree to which they depend on brain-power or hand-eye coordination.

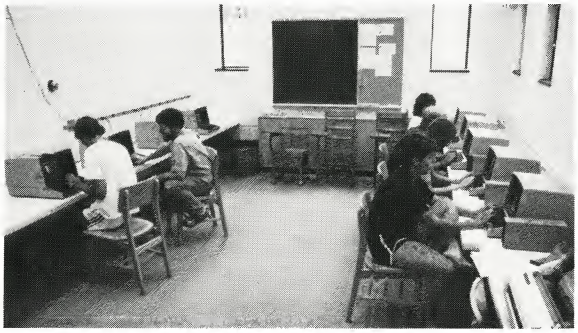

Photo Courtesy of Dr. Lynn Arthur Steen

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Back in the '70s, a lot of colleges in Minnesota were "all agog with the Apple." At St. Olaf College, however, they wanted a full professional keyboard, 80-column display, and a flexible operating system. So they chose to build and install H89s. They found the '89s both economical and powerful; and what's more, they used HDOS to hook up the '89s to their mainframe.

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Features

Kids & Computers: Herbert Is My Best Friend
Frank and Mary Lynn Hutchison 8
Some folks believe that kids and computers don't mix. (All that peanut butter and jelly getting into things.) Others believe that, yes, children should learn about computing, but you can't do it without Professionally Designed and Approved Software and Learning Aids. (As if the computer itself didn't already set you back enough.) Both positions assume that ordinary folks can't do the job. We offer here a modest rejoinder.

Letter-Quality Printing on a Dot-Matrix Budget
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The '89 Goes to College
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Tracking Home Finances with the Home Finance System
Steve Howard 31
It's easy to get a program that will balance your checkbook. A pocket calculator can do that. But will it give you reports of how much you spent, broken out for different budget categories? Or records of anything that was tax-deductible? Specialized reports come in handy when the I.R.S. comes knocking at the door. Do you want to keep track of things without spending the money for a full-sized business package? If so, Dr. Jay Gold has a program you'll want to consider.

More Than Just a Pretty Typeface
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Adding 16K Memory to the '89—A Low-Budget Alternative
Wayne Rash, Jr. 65
Kit building is still the most economical route to computer power. And you don't need to have built your computer in order to benefit from it. The memory-expansion board from J. C. Williams isn't strictly a kit, since you purchase separately the parts that go on it. But doing it yourself with help from Williams proves to be the most inexpensive way to take your RAM from 48K to 64K.

A New CP/M for the '89
Kirk L. Thompson 68
One of the most well regarded implementations of the CP/M operating system comes from Magnolia Microsystems. The latest version offers substantial documentation, an exceptional configuration utility, copy programs, and a variety of miscellaneous utilities to make life easier for you. You can set up CP/M from scratch, or use one of the configurations Magnolia has provided for your hardware. Altogether, it's more than just a run-of-the-mill implementation.

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Heath/Zenith Users in Uniform
Philip C. Weinberg 75
Dick Linder took his H89 to Antarctica. Wayne Linschied takes his '89 on board ship every time he goes out to sea for a month or more. They're just a couple of the Heath/Zenith users in the armed forces. They use their computers at home; moreover, in the midst of the military's mainframe mania, they've found plenty of ways to keep their micros busy at work. The Navy, Marines, and Air Force, maybe trying to catch up with them, have followed their example.

HUGCON 2—Twice as Good
Frederick Zimmerman 81

Getting Into Z-DOS Assembly Language—Quietly
D. C. Shoemaker 89
Writing in assembly language gets you as close to your computer's native tongue as you can get—and still understand what you've said. For those of you running Z-DOS on the H/Z100 who don't like the '100's key click, using assembly language is a good way to tell your computer to turn it off. Even if you don't have any experience with assembly language, this article can get you started.

More Double-Precision Trig Functions
Hugh Kenner 98
In *Sextant* #3, Fall 1982, we passed along Dr. Kenner's double-precision routines for sine, cosine, tangent, arctangent, and square root. Now you can fill out the set with arcsine and arccosine. These routines, like their predecessors, are both fast and accurate.

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Cover Photo Courtesy of Frank and Mary Lynn Hutchison

Photo by Charles Floto

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"When the hell are you guys going to do some advertising?"—Zenith Data Systems addressed this question at the Second National HUG Conference. ZDS's new corporate spokesperson was also on hand to watch things.

Photo Courtesy of Micro Peripherals, Inc.

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After your computer has done all its calculations, or word processing, or what not, you'll probably want a printed copy of the output. Any printer can handle ordinary text, but what if you want to change typefaces? And what if the output contains graphics? For these, you need a dot-matrix printer. And while you're at it, you'll probably want the printer to be durable as well as fancy. And easy to work on if you ever have to take it apart. Well, take a look at M.P.I.'s 99G.

Photo Courtesy of Smith-Corona

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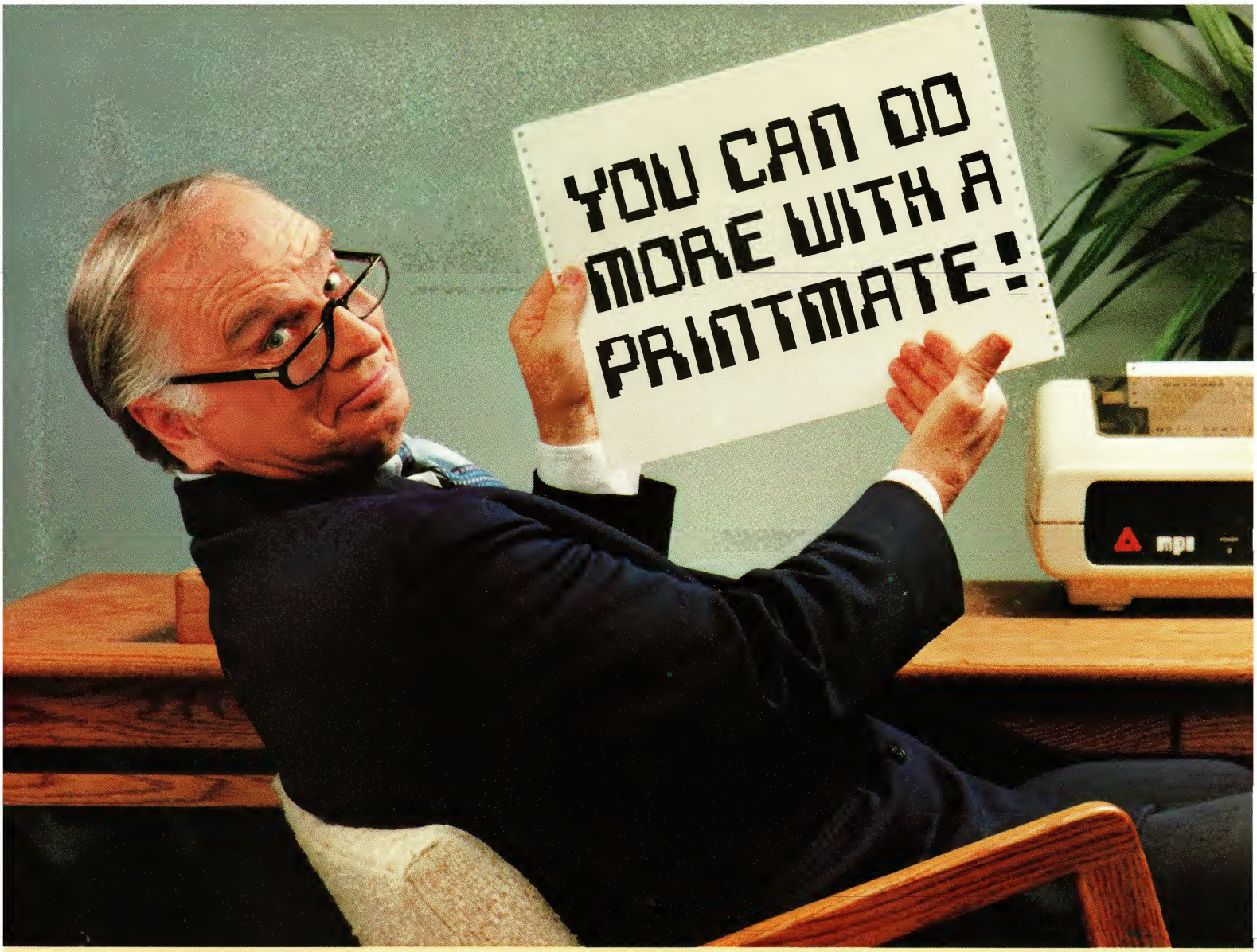
How many of us have concluded that dot-matrix printing looks inappropriate for our deathless prose? But who can afford a letter-quality printer at home until we get a lot richer? Well, if you're willing to forego speed, in order to save money, you don't have to wait. Your old Smith-Corona has an inexpensive younger brother that can team up with your Heath/Zenith computer to give you the spiffy copy you deserve.



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The Editorial Eye

This is the first issue of *Sextant* for 1984. There will be five more. In March we'll publish our first bimonthly issue. Others will follow in May, July, September, and November. The increased frequency of publication seems appropriate for several reasons. Readers have requested it. Advertisers have asked for it. Dealers desire it. Since our first issue appeared in March 1982, there have been numerous suggestions that we publish more than four issues a year. My reluctance to do so earlier was based on the feeling that we had not yet mastered quarterly publication.

Now I feel we have a good team in place to tackle the task. Our production staff has grown 50% with the addition of Martha Swain. Assistant Editor Jennie Allen represents a comparable increase in our editorial resources. Now that we're publishing six issues a year, we'll have four months to work on each one, rather than the three months we've been devoting to each of our quarterly issues. Fortunately, everyone here seems to be happily accepting the prospect of doing 24 months' worth of work annually. So far, we're actually having fun.

We even manage to get out of the office occasionally. In late October, we all attended the regional conference held in northern Virginia by the Capital Heath Users' Group. Earlier that month, five of us were in New York for Face to Face: The 1983 Publishing Conference and Exposition. We attended seminars on magazine design, editing, subscription and advertising sales, and working with free-lance writers. In addition to learning a lot more about magazine publishing, we had an opportunity to compare *Sextant* to a wide variety of other magazines. We picked out some areas in which to improve our efforts, and identified others in which we're doing relatively well.

Sextant Publishing Company invites you to compare this magazine to any of the others you read. Let us know what improvements you'd like to see. We want *Sextant* to be your favorite magazine. We want it to serve readers, article writers, advertisers, and retail dealers as well as any magazine put out by any other publishing company. As the only organization in the Heath/Zenith community devoted strictly to publications, we can't rely on other suppliers to Heath/Zenith users for our competition. So we invite you to judge us by the standards of the publishing world as a whole.

Charles Floto

At the Face to Face publishing conference, one of the exhibitors lured me into their booth by featuring caricaturist Sherry Lane. She captured what I'm assured is "the real me."

Caricature by Sherry Lane 212/675–6224

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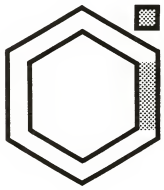

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Letters

Reset EOF Flag to Run Spooler Again

I am a charter subscriber to *Sextant* and avidly read each issue as it is received. I also use the ideas and concepts from many of the articles in the high school Computer/Physics/Electronics classes that I teach. We currently have three H89s, ten ET-3400s, and two H19s along with a Diablo printer and a Mohawk Data Sciences card reader and line printer. It looks a bit strange driving these large pieces of equipment (the card reader and line printer) from an H89 but the students don't seem to mind.

The Spooler presented in the Summer 1983 issue (#6), page 85, by A. E. Dessler was the ideal medium for me to use as an example of position-independent, relocatable code. When we brought it up, it worked without a hitch the first time. Unfortunately, it did not work the second time. Each time we wanted to spool something, we had to 'unload' and 'reload' the driver to keep it from hanging after printing the first access (four pages). It also refused to abort. The problem seems to be that the EOF flag gets set the first time and is never reset. The memory location associated with EOF retains the data from the previous execution. I solved this problem by adding two lines after WRT1 MVI M,00:

```
XRA   A     Clear Accumulator (new)
STA   EOF   Store 0 in EOF    (new)
CALL  ZBF   Zero buffer area  (old)
```

The program now works great.

Keep up the good work.

Roy Coleman
Chicago, IL

ACCESS Missing From Z100 Software Roundup

I was sorry to see that your Z100 Software Roundup (*Sextant* #7, Fall 1983) did not list ACCESS™, a communications program by John Hile, marketed by Hilgraeve, Inc. ACCESS runs on the 8-bit side of the Z100 under CP/M-85. This Z100 version of ACCESS was introduced in an ad in your Spring 1983 issue. Like the H8 and H/Z89 versions of ACCESS, it is a truly general purpose, menu-driven communications program. Doug Von Koenig, manager of the Toledo, Ohio Heath store, which sells an outstanding number of Heath computers to non-hobby types, says, "We recommend ACCESS over any other communications program we've seen. You just can't get more program for the money. Our customers find it very easy to use."

ACCESS supports use of function keys (labelled on the screen's 25th line) to control send, receive, file, and print operations. ACCESS allows the user to define and store seven program and protocol configurations—thus permitting fast setup for communication with up to seven distinctly different remote systems. Text, data, hex, or .COM files (Modem 7 protocol) may be transferred with full menu control of carriage return/line feed, baud rate, use of memory buffers and ports, and other communications protocol. ACCESS also features a remote mode of operation, auto-dial, auto-log-on, and error-checking. Operating requirements are 48K RAM, CP/M, and one disk drive. ACCESS is available at $39.95 from many Heath/Zenith dealers or direct from Hilgraeve, Inc.

Matt Gray
Hilgraeve, Inc.
P.O. Box 941
Monroe, MI 48161
313/243–0576

Ground Plane *Can* Be Installed on H8

I would like to make a comment on an article in the Spring 1983 issue of *Sextant*. In the article "Improve Your H8's Reliability: Install the Trionyx Motherboard" it is stated (on page 60) by the author that "... the addition of a ground plane to the original H8 motherboard is impossible." I am writing this letter on an H8 with a ground plane that I added to the original motherboard.

What has been done is to glue a piece of aluminum foil to the top of the board with cut-outs for each of the connectors, and the power supply. The foil is grounded using the mounting hardware. So far I have had none of the problems mentioned in the article, because this addition was made during the original construction of the H8. But there is no reason that it can not be back fitted to an H8.

James E. Payne
Port Orchard, WA

Keep S-BASIC House Furnished and Stocked

As the author of S-BASIC, described in *Sextant* #2 (Summer 1982), I was pleased to read Hugh Kenner's favorable comments about it in his article "Pascal Elucidated" in *Sextant* #6 (Summer 1983). I would like to add an amendment to Mr. Kenner's remarks.

Hugh Kenner characterized S-BASIC as "a comfortable halfway-house en route to Pascal." While it may indeed be that in a *learning* sense, it is well to keep that house furnished and stocked for continued use where appropriate.

I also moved on from S-BASIC to a more sophisticated programming language—to C instead of Pascal. (The S-BASIC translator is written in C.) But I still find S-BASIC very appropriate for certain kinds of programs: those where the ultimate of speed is not required, where BASIC's good capabilities for string and numeric data are useful, and where fast, easy development and checkout are desired. To achieve successful compilation and execution of a C or Pascal program is considerably more difficult than getting an S-BASIC program to run correctly! That investment of time and effort may be appropriate for some programs (certainly for software for sale), but not for others. The example S-BASIC programs on the S-BASIC distribution disk (the sort ALSORT.SBA; the checkbook balancing program CHECKBAL.SBA) were written to serve my own needs, and they still do.

S-BASIC is available for HDOS, CP/M, and Z-DOS for $49.95 from Sunflower Software. The Z-DOS version of the S-BASIC translator is true 16-bit code, generated with a C compiler for the Z100/IBM PC, so it is very fast! S-BASIC and Z-BASIC on the Z100 are a powerful combination.

W. K. Clarkson
Palos Verdes Estates, CA

[Sunflower Software, Inc., 13915 Midland Drive, Shawnee, KS 66216, 913/631–1333.]

Another View of H120-Building

I enjoyed Mr. Cook's humorous article "Building Heathkit's H120," in the Fall issue of *Sextant*. However, to my disappointment I found it lacking in technical detail with regard to problems the kit builder may expect to encounter with this kit. I thought potential H120 builders might find the following comments, drawn from my own experience, to be of interest.

One thing veteran Heathkit computer builders will be glad to hear is that there are no wiring harnesses to assemble, no tiny spring clip connectors to crimp and solder, and no little brass fittings to press into the cabinet enclosure. All of this tedious stuff was done by some nice person in Benton Harbor. The only real electronic construction components are the video deflection board and the H-207 disk controller board.

One of the things that could give some builders problems is the monitor ROM and associated jumpers on the main circuit board. The Heathkit instructions show jumpers J101 and J102 set for an 8K ROM. The kit I assembled, however, came with a 16K ROM installed. If you follow the instructions in such a case, the final assembled machine will not work. In general these jumpers are probably properly set as they come from the factory. If you think you must change them, check the markings on your ROM to

make sure it is the 8K ROM specified in the manual. Unfortunately, the assembly manual simply says you should set these jumpers as shown. You would only be able to diagnose this problem by looking through the Z100 technical manual. The 16K ROM I received is apparently an enhanced version of the original 8K one. It has lots of neat commands including Examine, Dump, Color-bar, Fill, Input, System, Test, Version, Output, and Xecute. These are documented in Appendix L to the Z100 User's Manual.

Another possible source of confusion comes in the ohmmeter checkout of the video deflection circuit board. The Heathkit documentation assumes that the negative side of the ohmmeter's battery is internally connected to the black test lead of the instrument. This is the "logical" way for a meter to be designed; however, there are some meters which were made in a "backwards" fashion, my old Lafayette 30,000-ohms-per-volt multitester for one. If you use one of these meters you may get some apparently erroneous readings in the ohmmeter checkout stage. Your meter can easily be checked with any silicon or germanium diode. A properly designed meter will read nearly infinity when the diode resistance is measured with the red test lead attached to the banded end of the diode. With the leads switched, the diode should conduct and you should observe a much lower resistance.

When installing the programming jumpers on the disk drives, I recommend you not cut the jumpers but simply bend the leads out on the appropriate pins. This not only saves the trouble of hacking through the jumper foils but makes it easier to reinstall the drives in another machine or reprogram them for any other reason.

According to the Heath assembly manual, when adjusting the width of the display image on the CRT, you should leave about one inch on either side of the display area. This looks funny, and I chose to widen the image to within ½" on either side (the same as on the top and bottom). If you do this you will be specifying an aspect ratio of about 0.54 instead of the 0.48 which will be assumed by Z-BASIC. If you draw CIRCLEs without specifying this aspect ratio the circles will be noticeably elliptical. Curiously enough, if you run the older version of Z-BASIC, which comes on the Z100 demonstration disk, your circles will come out just fine. I'm fairly sure this change was made in order to accommodate the RGB color monitor. In any event, for now I prefer to fully use the screen area and simply specify the aspect ratio when necessary to correct bulging pie charts.

One of the more tedious chores involved in assembling the H120 is the calibration of the disk controller card. The assembly manual takes you through a series of steps using jumper wires and fabricated sockets in order to allow you to calibrate the card using only a voltmeter. The procedure seems to work alright; however, if you have access to a frequency counter, then the procedure described in the Z100 technical manual is much easier and probably more accurate. One of the problems with the voltmeter calibration is that you can possibly lock the frequency adjustment onto a harmonic of the desired 4 MHz setting. Use the frequency counter calibration if you possibly can.

One more item worth mentioning: on the newer kits, the "Heathkit" logo plate has been replaced with a more professional plate labeled "Heath Computer Systems." Personally, I like the change.

Glenn F. Roberts, Ph.D.
Knoxville, TN

Another Way to Silence the Z100's Key Click

I attempted to break the code on the Z100 escape codes when I read Jerry Pournelle's comments in *Byte* magazine. He said he loved the Z100 but hated the key clicks. As Frederick Zimmerman states in the Summer issue of *Sextant,* there seems to be no way to invoke the escape codes except to put them in a file and call TYPE. The problem is that Z-DOS resists the attempt to create a file with escape codes. I finally managed to do it by using DEBUG to create a HEX file. I recently found that when F8 is pressed it enters the escape code and displays it. By using EDLIN and the F8 key it is easy to create files with escape code commands and invoke them by TYPEing them.

Another mystery of the Z100 is how to reassign keys on the keyboard. The Z-DOS manual is very cryptic, and the CP/M-85 manual is a little better. Again, the only way I could find was to use DEBUG to modify the ALTCHAR.SYS file. I studied the foreign language files to determine the format. After some trial and error I was able to interchange the ; and : to eliminate the constant shifting to use the colon in Z-DOS and CP/M commands.

I enjoyed my first issue of *Sextant* and hope that future issues will contain more info about the Z100.

Daniel Hollands
Webster, NY

To silence the Z100's key click with assembly language, see "Getting into Z-DOS Assembly Language—Quietly" by D. C. Shoemaker, in this issue.

SCM TP-I a "Best Buy"

May I fill you in on my experiences with the SCM (Smith-Corona) TP-I printer? If I were a consumer testing organization, I would rate the SCM TP-I as a *best buy!* I purchased the TP-I through a mail order house in the States, ordering the parallel port version. My interface board and driver are by FBE Research, Inc. (which are also very fine pieces of work). Shipment through the Army Postal System jiggled loose one of the screws that is on the underside of the carriage mechanism and caused the carriage to jam. I thought that this might have been due to using the machine on a 220 volt to 110 volt transformer, since I did not, at first, dismantle the TP-I when it didn't work. After purchasing the TP-I maintenance manual ($15.00) and receiving a reassuring note from SCM's customer service, I found the problem in about 45 seconds, and the machine has been perfectly operating ever since. The manual appears to have been written by someone who learned technical writing at Heathkit. It is concise and complete, profusely and expensively illustrated, and bound into a loose leaf binder with silk-screened cover. One of the pull-out diagrams used with the logical "go-no go" flow chart of faults and malfunctions will allow you to fix anything that might break.

Ok, so now for the bad news: It *is noisy*; and it is relatively slow. I use the TP-I at my office, where I prepare all unclassified correspondence and other military paperwork on it. . . . Now, both the H89 and the TP-I have absolutely appalling Tempest signatures so that I wouldn't in any circumstances put classified or sensitive information on them. The multistrike ribbon is pretty cheap looking when it prints; the carbon film is clean. However, the carbon film will only last about 12 single pages.

SCM's service organization is, in my opinion, outstanding. They obviously desire my business (or at least make me think they do), unlike most other vendors of micro-supplies. Their supply system turns an order around for me in about 10 days, which is excellent considering at least ¾ of that time is taken up by the Army Postal System shipping my letters by way of Iceland or Botswana or having the stamps chewed off by drug-sniffing dogs. They answer their mail and the technical staff is courteous.

The TP-I here has been cranking away for several weeks, printing between 5 and 50 pages per day, single copies up through 5-part no carbon required teletype paper. Now if SCM would come out with a "blimp" (sound attenuation box) for the TP-I, that would be the icing on the cake.

Bottom line is this: The TP-I is certainly no Diablo; but then I didn't pay a couple of grand for it either. The price is right, half-a-grand, the documentation excellent, and I'm happy with it.

Thanks for your fine publication.

Dave Mann
Heidelberg, Germany

Correction

There was an error in the program listing (p. 91) accompanying "Index Your HDOS Disks," by Stephen E. Auyer, in the Fall 1983 issue of *Sextant.* In line 2650, "20J" should be replaced by "2^J."

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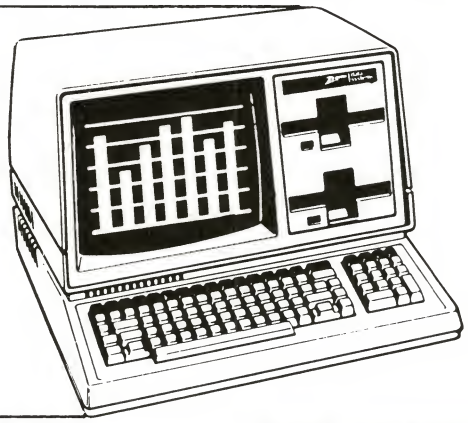

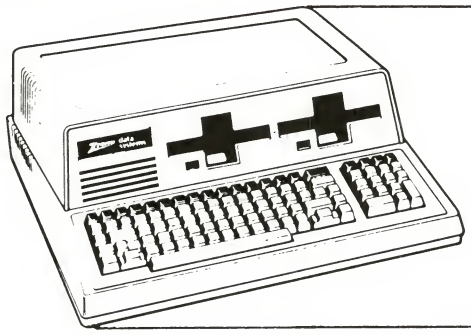

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Kids & Computers: Herbert Is My Best Friend

In teaching your children about computers, it helps if you can keep ahead of them.

Frank and Mary Lynn Hutchison

As proud owners of a new H89 (affectionately called Herbert) and proud parents of three preschoolers (affectionately called Chris, Emily, and Richard), we (Frank and Mary Lynn, by the way) wanted our children to learn about computers. We wanted them to be comfortable around computers, to know how to operate them, to use computers as tools, to learn to take proper care of a computer and the associated paraphernalia, to recognize opportunities, and to implement new computer uses of their own design. Our goal was not to develop computer prodigies, but to train computer literates.

We looked for commercial educational software and were disappointed by the meager selection. There were several drill programs, some of them fairly clever, but we wanted our children to learn more than multiplication tables and state capitals.

Computers do not need to be* made *appealing to children; they* are *appealing to children.

We attended seminars on computing for kids and heard the virtues of Logo lauded. Logo teaches problem-solving skills, encourages creative thinking, and provides opportunities for experimentation and discovery learning by putting the child in charge of the computer. This sounded better. But Logo isn't available for the H89. Could we write our own simulation? An experiment produced a primitive first approximation of turtle graphics, greatly hampered by the H89's lack of dot-resolution graphics. To refine and expand it would take time we did not have. We gradually realized that our children didn't need Logo, anyway.

While Logo is a well designed and very clever programming language, the manner in which it is usually packaged and promoted limits effectiveness: Logo is promoted as a children's computer language; it is cute. Computers do not need to be *made* appealing to children; they *are* appealing to children.

Logo does not take advantage of the real adulation small children feel for their grown-ups. Children learn to walk, to talk, to use acceptable table manners, to write, and to do a million other things by imitating adults. Daddy's tools, Mommy's lipstick, anything their parents use becomes intensely fascinating. Children want to do what they see their parents doing.

Thanks to the folks at the Children's Television Workshop, most three-year-olds have at least a nodding acquaintance with the alphabet and the numerals from one to twelve. They find it every bit as exciting to make letters appear on the screen as they do to "teach a turtle to draw a box," perhaps more so because Daddy spends far more of his time on the computer making letters than he does teaching turtles. If chimpanzees can learn to type by matching symbols, so can preschoolers.

We were being watched

Five-year-old Chris was fascinated by Herbert. The "beep-beep" would bring him running from any activity in any other part of the house. He'd peer over Frank's shoulder while he programmed or wrote his dissertation with the word processor. Sometimes he asked questions. Usually, he was very quiet.

We acquired a few games: The Software Toolworks' INVADERS, HUG's version of "Adventure," and a book of BASIC games programs written for the TRS–80 which Frank adapted for our use. Because the most vulnerable components of the computer system were the disks, we decided that Chris could use the computer only under direct parental supervision. He could play any of the games he wished, but an adult would BOOT the disk for him.

Chris quickly showed us how impractical this policy was. One afternoon, Mary Lynn heard the tell-tale "beep-beep" and investigated. Chris had correctly BOOTed the games disk and had accessed INVADERS. There was no going back. If we didn't teach Chris to operate Herbert, he would teach himself.

A family council produced a set of computer rules:

1. No food or drink is allowed near Herbert.
2. Disks must be handled by the label edge only and belong in their jackets in their library case when not in use.
3. Herbert must *never* be turned on unless the disk drive is empty.
4. At the conclusion of a computer session, disks must be put away, Herbert must be turned off, and his dust cover replaced.
5. Chores and schoolwork must be completed and parental permission given before children can play with Herbert.
6. Daddy has first priority for computer time.
7. Daddy's and Mommy's disks are off limits.
8. Infractions of these rules result in denial of computer privileges.

These rules applied to *all* computer users in the Hutchison family, including Daddy and Mommy.

It is prudent for anyone who uses a personal computer to keep an extensive library of back-up files on separate disks. When children are sharing a computer with adults, it becomes essential. The

Photo Courtesy of Frank and Mary Lynn Hutchison

Teaching your children about computers can be enjoyable if you're willing to have them on your back every so often. After reading the article, though, we have to wonder—is Chris (plaid shirt) asking his father (white shirt) a question? Or has he just spotted an error?

attractions of imitating his parents soon became more than Chris could withstand. He discovered Daddy's "Check Register" programs and Mommy's files of articles in progress.

We enforced Rule 7 repeatedly, with little effect. After we acquired a second disk drive, Mommy's writing files, Daddy's Ph.D. dissertation, and other important files were stored on nonbootable disks. Back-ups and original disks were kept under lock and key. Then, Chris learned to access the second disk drive.

We considered using passwords, but decided not to challenge him further. Instead, we reached a compromise. For his sixth birthday, Chris received his own disks and own library case. Included in his files were copies of Check Register and our word processor. His disks are off-limits to other family members without prior permission.

About this time, Chris discovered BASIC. One of the first games Frank modified for Herbert was the spelling game HANGMAN. Chris soon became proficient at it and memorized the original file of fifty words. One afternoon, he came running out of the bedroom, grabbed his picture dictionary, and dashed back. Thinking that he had finished with Herbert for the day, Mary Lynn checked to make sure he had turned Herbert off. She found him busily changing the DATA file of words for HANGMAN. Soon, he was attempting other program modifications. Benton Harbor BASIC proved to be an excellent language for this purpose, since it requires that modified files must be SAVEd or REPLACEd and allowed Chris to experiment without ruining working files.

Between Frank's Ph.D. dissertation and Mary Lynn's free-lance writing, Herbert's heaviest use had become word processing. The first programs we bought after we built Herbert were The Software Toolworks' PIE and TEXT. Chris quickly learned to access files with both. He began to create his own files of letters, lists, and stories.

Chris discovered the device driver which ran our printer. To avoid being buried by his output, we deleted the device drivers from his disks. He remembered watching Frank use ONECOPY. ONECOPY's screen prompts allowed him to restore the device drivers. Soon, he was using both disk drives to COPY files.

We realized what was going on

By now, a pattern was established. Chris learned to use Herbert by imitating his parents. Whenever he ran into a roadblock, he tried something he had seen us do. His attempts weren't always successful, but he wasn't afraid to try. He acquired problem-solving skills dealing with adult computer situations instead of playing in the artificial environment of Logo. The many prompts and protective features of HDOS and Benton Harbor BASIC provided a relatively safe and encouraging environment in which Chris could experiment.

While we made use of drill programs, we soon learned that to be effective, a drill must be capable of increasing challenges and must also provide varied approaches to the material. At first, Chris was intrigued by an arithmetic drill program Frank wrote. As his interest waned, we incorporated rewards by automatically CHAINing to a randomly selected game program at the conclusion of each drill session. Chris soon realized that he could bypass the drill and reach the games by using CHAIN.

The same was true of games. As Chris became more proficient at INVADERS, he lost interest. His only concern became keeping a higher score than his sister. Adventure, on the other hand, held his interest and also required accuracy in his responses and improvement in his reading skills.

Not all children are as self-motivated as our Chris. Most will need more parental direction and guidance. Four-year-old Emily was also interested in the computer and delighted in filling the screen with characters. Where Chris had impatiently tried new skills, Emily was content to accept the status quo. Rather than try to BOOT up herself, she would demand that Mommy come set things up for her.

We encouraged her to try things for herself, often literally looking over her shoulder to provide encouragement. We taught her not to kneel on the keyboard when she reached back to turn Herbert on, showed her how to handle disks properly, how to BOOT and access files. To help her remember, we made a 5x8 card which listed the commands she needed. She could type them in by referring to her card.

At first, Emily had difficulty mastering the hand-eye coordination the games required. With our encourage-

EDT is NOT a Word Processor

The "microcomputer revolution" has brought us programs which do an excellent job of removing the obstacles in the flow of language from the human mind to the printed page. These word processors usually include operational modes which allow them to be used to create program source code. The "non-document" modes are secondary to the purpose of these processors, however, and are often inefficient and filled with traps for the unwary.

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EDT requires 128 K bytes of system memory and is available for many MS-DOS machines including the IBM PC (PC DOS), the Zenith Z-100 (ZDOS) and the Seattle Gazelle (MS-DOS).

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ment and much practice, she overcame her frustrations and was soon proudly showing her friends how to play INVADERS and MUNCHKIN. Her favorite present on her fifth birthday was her own library case and disks. At about the same time, she learned to read. She is now proficient with the word processor as well as the game programs.

Emily and Chris provided excellent role models for their younger brother. Three-year-old Richard also started filling the screen with characters. He progressed to playing INVADERS and MUNCHKIN after they were set up, and can now BOOT up himself, but had difficulty

For his sixth birthday, Chris received his own disks and own library case. Included in his files were copies of Check Register and our word processor.

accessing the games due to spelling errors. He is frequently frustrated by this, but, with the help of a 5x8 reference card, he is learning to be more accurate.

While Richard cannot read, he does recognize the letters of the alphabet and is beginning to associate written letter patterns with words, skills which are precursors to reading. His computer experience seems to be helping him learn to read, which may be a very real benefit of computer literacy, one not as easily provided by turtle graphics.

Do you want to try it?

A good starting point for parents who are interested in teaching their children how to use a computer would be a reference book on how to communicate and deal with children. We have found Fitzhugh Dodson's *How to Parent* (Signet, published by New American Library, Inc.; New York; 1971) to be invaluable, especially his chapter, "Can You Teach a Dolphin to Type?"

Explanations must be given patiently and on an understandable level. Many ideas must be re-explained several times before they are assimilated. When Emily was first learning to access programs with the help of her 5x8 card, we had to lead her carefully through each step:

"What is the first letter you need, Emily?"

" 'M'."

"Then type in an 'M'. What's the next letter?"

After a while, she would come to us when she ran into problems. "Mom, I can't get MUNCHKIN."

"Are all your letters in the right order? Check and see."

"Oh, I mixed up the 'U' and the 'N'."

"Try it again, then. I know you'll get it right this time."

It is important to let each child progress at his or her own pace. Whenever we have attempted to push a child beyond the level where he or she is comfortable, we have met with frustration, tears, and complete loss of interest in the computer. We have learned to back off at that point. Within a few days, the child is back at the computer. Emily has shown no interest in programming and we have made no attempt to teach her pro-

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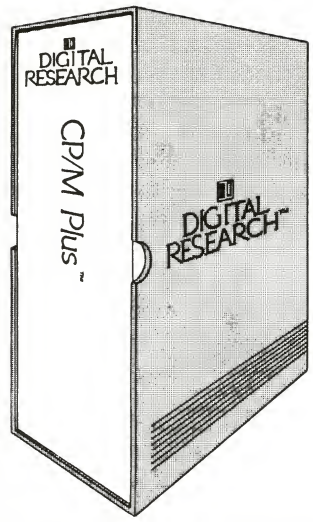

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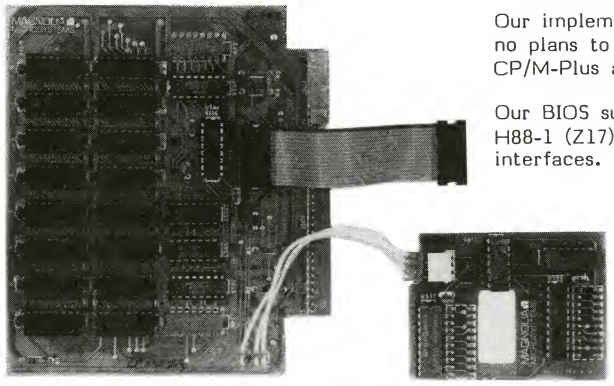

Our implementation of CP/M-Plus REQUIRES the use of our 128K RAM board. We have no plans to implement an un-banked memory version, most of the advantages of CP/M-Plus are neither available (nor practical) in an un-banked version.

Our BIOS supports both our 77316 and Zenith's Z89-37 Double Density controllers, Heath's H88-1 (Z17) Single Density controller, and our 77314 CORVUS and 77320 SASI-bus interfaces.

We are including the SOURCE code for our BIOS, together with Digital Research's MAC, RMAC, LINK, and SID software development tools, you may customize it to your specific application.

Orders must specify the Double Density controller and boot drive: the Z89-37 (as used in the Z90) or our 77316 (5-inch or 8-inch).

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These boards are made available apart from our subsystems for use by 'Systems Integrators'. End-users should carefully consider their skills and desired level of involvement before undertaking this responsibility; purchasing a complete subsystem from a qualified integrator may be a wise choice.

Although similar in name and apparent function, these boards fall into two distinct classes:

- INTERFACE boards connect a disk subsystem (containing a controller) to the computer. These boards include the Z89-47 and Z89-67 and our 77314, 77317, and 77320 interfaces.
- CONTROLLER boards actually control a plain disk drive. These boards include the H88-1 (Z17) and Z89-37, and our 77316 Double Density Controller.

All Magnolia I/O boards use proprietary techniques to expand the 89's I/O addresses, allowing use of more than Zenith's 5 (3 serial ports, 2 disk controllers). Since our INTERFACE boards also contain 3 RS232 ports (replacing the machine's H88-3) allowing expansion of the I/O capability without using an additional card slot.

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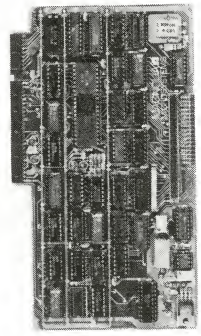

This board adds complete hardware and software support for four 8" single- or double-sided AND four 5" SS or DS, 48- or 96-track-per-inch (40- or 80- track) drives, at both single and double recording densities.

This controller is compatible with 8" drives by Shugart, Qume, and Tandon; 5" drives by Siemens, Tandon, and MPI; and most other 'industry standard' drives (possibly depending on the skill level of the experienced 'Systems Integrator').

SASI-bus Winchester Interface
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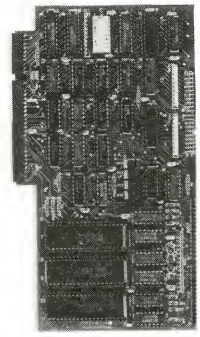

This board (functionally replacing the Z89-67 interface) contains 3 RS232 ports and can support up to 8 SASI-bus disk controllers, with up to 4 drives on each!

It is compatible with Winchester controlers by Xebec, DTC, Shugart, and others, as well as Zenith's Z67. CP/M software support for popular controller/drive combinations is included.

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gramming skills. She is content to work with the programs already provided and is as capable with our computer as many adults who rely on canned programs.

It is also very apparent when a child is ready to move on to the next level. "Mom, why is the MUNCHKIN maze always the same? Can we make a new one? How?"

Needless to say, this kind of involvement takes a great deal of time. It takes time to set up disks and make backups. It takes time and patience to comprehend what the child wants to do with the computer. It takes time to demonstrate new techniques. It takes time to make reference cards. It takes time to help a child find his mistakes and correct them.

Taking it a step at a time

Chris wanted to write a "Star Wars" program. He wrote the program's introductory explanation (which is what he sees first on all other games) and attempted to imitate the BASIC statements he saw in other programs. The result was frustration—for Chris, whose "program" didn't do what he wanted, and for Frank, who tried to explain why each statement was wrong and how to correct it. Chris needed to master BASIC commands before he could write successful programs.

To meet this need, Frank created a short course in BASIC. Each lesson introduced a single BASIC command, starting with PRINT, INPUT, LINE INPUT, math operations, GOTO, and IF...THEN statements.

The lesson on PRINT statements went like this:

1. PRINT statements write on the screen.
2. To write your name, you use the form:

PRINT "Chris"

3. Write a PRINT statement that has your whole name.

4. PRINT statements can write two or more things with the same statement.

PRINT "Chris";" has a space ship."

5. If you use a "," instead of a ";", what happens?
6. What happens if you write a PRINT statement like:

PRINT

7. Write three PRINT statements which say anything you want.

Chris has mastered each lesson quickly and makes fewer syntax errors in his programming attempts. By experimenting, he has discovered concepts not specifically mentioned in the lessons. For example, he showed his father how to PRINT several blank lines by using multiple commas. He still has trouble combining statements into coherent programs, but will undoubtedly acquire that skill with practice and maturity. These lessons were successful because the concepts were broken into very small bites, each new idea was demonstrated simply, Chris was given an opportunity to experiment with each new step, and we made a concerted effort to patiently listen to his ideas.

What has it cost us?

What has it cost us to encourage the children to use the computer so widely? Herbert has been operational for two years. In that time, we have "lost" two disks. We have also replaced the transistors on our video board after Chris "repaired" Herbert by dropping a small screwdriver down the air vents. Including paper and disks, the direct cost has been less than a hundred and fifty dollars. It would have cost more to send Chris to computer camp for two weeks. We doubt he would have learned as much.

Seventy years ago, Mary Lynn's grandparents got their first telephone. Their children were not allowed to touch the phone, let alone use it. The telephone was accorded the status of a household deity, something referred to only on special occasions. Many families display a similar attitude toward their home computers.

We do not advocate "turning preschoolers loose with computers." Parents have a responsibility to teach their children acceptable behavior, whether the subject is table manners or computers. It has been far easier to "teach them correct principles, and let them govern themselves," than to stand constant guard over the computer console.

Are our children exceptional? Well, yes, we think so. More important, they are very comfortable with our computer. They've learned to use it carefully, responsibly, and creatively. They're achieving the skills Logo was designed to teach, without Logo. How did we do it? We acquired a few off-the-rack games, a word processor, and several homemade programs. We let our children watch us when we used the computer. We weren't afraid to let our children touch the computer. We taught our children to access the programs, and allowed them to experiment with procedures they'd seen us use. We spent time working with our children on computer projects of their choice. We devised simple step-by-step tasks to teach BASIC programming.

We have found one major drawback: there is almost always a queue waiting to use Herbert. In the not-too-distant future, we will have to upgrade Herbert to multi-user capability, or become a two-computer family—just so Mommy and Daddy can have a turn.

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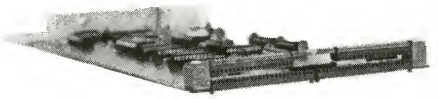

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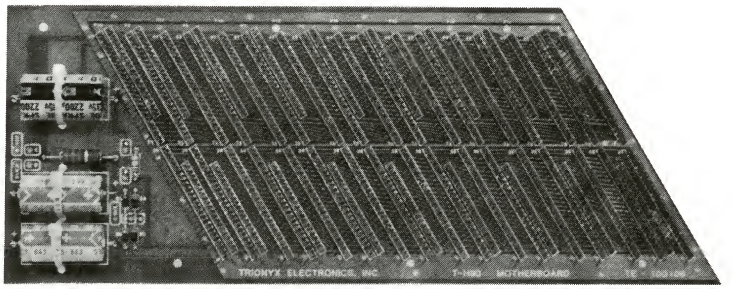

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Gordon W. Nichols

Soon after I built my H89 computer, I realized that a computer without a printer is like a camera without film. It may be fun to operate it, but there is nothing to show for it when you are finished. Every time I used the computer, I wanted a printed record. With high hopes, and very little cash, I investigated printers.

There are two popular types of printers for computers on the market: the dot-matrix printer, and the daisy-wheel printer. The dot-matrix printer with its low cost and high speed is ideal for program listings and general reports; but many people need a printer that prints like a typewriter, creating fully formed characters. This is particularly true in word processing where you don't want your letters and manuscripts looking like a mailing from Publishers Clearing House. Until recently, writers had to bang out their manuscripts on their trusty portables, even if they owned computers, because of the high price of daisy-wheel printers. With daisy-wheel printers selling in the $2,500 class, the printer was often more expensive than the computer. Things have changed. Now there is a reasonable selection of daisy-wheel printers under $1,000. Since I wanted a daisy-wheel printer for writing articles, and since I was cheap by nature, I decided to find out what you get for your money when you buy the lowest priced printer on the market.

Based on the advertisements in the popular magazines, the Brother HR–1, the Sanyo PR5500, the Bytewriter, and the Smith-Corona TP–1 are all available for less than $1,000. The least expensive and the most advertised is the Smith-Corona TP–1. It appeared in seven different ads in a recent computer magazine compared to a total of four ads for the other three combined. It carries a "list" price of $895, with mail-order prices ranging from $579 to $679. I purchased my printer through the mail for $599 including shipping from The Bottom Line, Milford, New Hampshire 03055. In that none of these printers were available locally at that time, I bought it "sight unseen."

What do you get?

It is an unfortunate fact of life that you rarely get more than you pay for. So how did I make out? In the first place, I had to be willing to accept a printer that will print a little over one hundred words per minute instead of three hundred like the "big boys" do. Also, it is not one of the printers listed in, and supported by, my Heathkit software documentation.

Photo Courtesy of Smith-Corona

I called fourteen stores listed in the computer section of the Yellow Pages for Dallas-Fort Worth and not one of them carried any of the four low priced printers. In fact, some of them had never heard of the Smith-Corona printer, and several predicted all kinds of doom if I purchased it. I soon found out one thing about computer stores—if they don't sell it, they don't want to talk about it!

What did I get for $599? As Johnny Carson says, "There's good news and there's bad news." First, the good news. I received a well-built, rugged printer that does a beautiful job of printing. The printer is made in the U.S. and the craftsmanship is excellent. In the five months I have owned it, it has been used extensively and has required no maintenance of any kind.

The TP–1 is strictly a remote printer; it does not have a keyboard. Two choices had to be made before I bought it. I had to choose either 10 pitch (characters per inch) or 12 pitch. I could not have both. I selected 12 characters per inch. I also had to choose either a parallel interface or a serial RS232C-compatible interface. That was no problem because the output of the H/Z89 is in serial form.

The carriage will hold 13" wide paper but the actual printable width is 10.5". That equates to 105 characters per line in 10 pitch, and 126 characters per line in 12 pitch. The paper is held by friction, exactly like a typewriter. According to Smith-Corona there is now a tractor feed available and the price is supposedly about $199. That's all I know about it. They sent no literature and I have been unable to find anyone locally who sells it.

The daisy-wheel has 88 printable characters. Unfortunately, the backward slash, used often in computer programming and word processing, is not one of them. (If you send the printer a backslash, it gives a space instead.) A complete character set is given in the manual with the equivalent decimal and hex values.

There are nine daisy-wheels made for the TP–1. They are: #300 Pica 10, #301 Corporate 10, #303 Judicial 10, #304

Regency 10, #902 Tempo 10, #356 Elite 12, #358 Tempo 12, #359 Presidential 12, and #346 Script.

There is no pitch given for the Script. It is classified as "neutral." They claim it works equally well on ten or twelve characters per inch. That is a matter of opinion. I always assumed that "script" should resemble writing with the letters linked together. This is true at twelve characters per inch, but at ten characters per inch there is a space between the letters. I prefer the clean, crisp look of the "Presidential" for regular use. However, "Corporate," "Tempo," and "Script" would all add a distinctive appearance to correspondence. Any of the twelve-pitch daisy-wheels can be used on a ten pitch machine. There is just more space between characters. The daisy-wheels cost about $7.95 each.

The printer is compact in size: 6.4" high, 19.5" wide, and 13.5" deep. It weighs 20.7 lbs. The cooling fan is on the back so you must allow more depth than the 13.5" in order to assure proper cooling.

Some of the bad news is that the TP–1 is manufactured by an old-line typewriter company. They obviously still think of the TP–1 as a typewriter instead of a computer printer. This is very evident in the way they handle line spacing. A LINE FEED from the computer will cause the printer to single space, space-and-a-half, or double space. However, these are not selectable by the computer, they are mechanically set by a lever on the printer, the same as is done on a typewriter. Also, you cannot CARRIAGE RETURN without an automatic LINE FEED. This makes underlining quite difficult, but not impossible, as will be explained later.

More bad news is that the print speed is only 12 characters per second, but it is really slower than that because of the time required for the carriage return and the time required to insert individual sheets of paper. To print a five-page manuscript (80 columns by 37 lines per page) takes eighteen minutes, which includes inserting the five sheets of paper. The same manuscript on a Diablo printer would take about five minutes.

Though the printer is slow, the results are beautiful. The type is straight, clear and even in blackness. The printer is perfect for writers who do all of their composing on the computer screen and just print an occasional draft and the final manuscript.

Setting up

The "Operator's Manual" is as practical, sensible, and well done as the printer. It gives you everything you need to know to operate it, such as how to turn it on, set the linespace selector, and insert the paper (with detailed sketches). But you need to know a lot more about interfacing it than is given in the book before it becomes an operating part of your Heathkit computer system.

There is one switch on the front. It's one you will probably never use because the "Set" position is used with continuous forms which would require the hard-to-obtain tractor feed. Put the switch in the "Clear" position and forget it. The power switch is in the same inaccessible place on the back as it is on an H/Z89. That's called standardized inconvenience.

When you plug it in and turn on the power, the printer does a neat little choreographed self-test routine. First, it hurries over to column 85, then executes forty print cycles, beeps, hurries back to column 15, beeps, and executes 15 backspaces. Finally it utters one more beep and is then ready to print. If this doesn't happen when you turn it on, maybe you should remove the packing material from under the cover. (Guess how I found that out.)

If you lift the cover, all printing will stop immediately, but will resume where it left off when the cover is closed again. I use this feature to stop the printer to reload paper when doing a long listing which has no form length commands. The trick is to quickly raise the cover while the carriage is returning. (If you stop the printing from the computer, the printer will print until its buffer is empty—up to 255 characters before stopping.)

Changing the ribbon or the printwheel is very simple, as explained on page 16 of the manual except for one thing: it is very difficult to do if the printer is in the normal "column 1" position. When you try to move it manually, you will find it doesn't move. To make life easier, turn on the printer, and while it is doing its little dance, raise the cover when the printwheel mechanism is somewhere in the middle of the carriage. Then turn off the printer, as a matter of safety, while changing the ribbon or printwheel.

Buying the ribbon was another problem. I wrote a letter to the mail-order house where I bought the printer inquiring about ribbons. I never received an answer. Only one Smith-Corona dealer in Dallas-Fort Worth had ribbons and the store was only open Monday through Friday, when I was at work. Finally, I had to arrange to have the ribbons mailed to me. The same type of ribbons are used on all the Smith-Corona electronic typewriters—the Ultrasonic, the Memory Correct, and the Typetronic II. My local office supply store had never heard of those machines either, but things are changing. Recently, three local stores have begun to carry the TP–1 and a limited selection of ribbons and daisy-wheels. Of the ten types of ribbons available according to the literature (including some in red,

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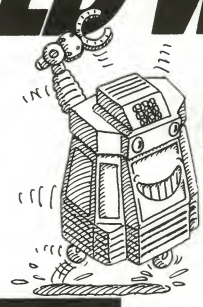

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green, blue and brown), I have had to settle for the reusable black nylon fabric ribbon ($3.95), and the "Multi-Strike Black Film" ribbon ($7.95), because they were the only two anyone has in stock. The tradename for the fancy ribbons which I could not find is "Lift-Rite."

One of the easiest ways to do word processing using the Smith-Corona TP–1 with the H/Z89 is to use the CP/M operating system and Peachtree's Magic Wand. These both are available from Heath.

Getting it to talk with your '89

It will only take one reading of the Heath section of the CP/M manual to realize that the Smith-Corona printer is not one of those that the H/Z89 will readily support. However, a few straightforward changes in the software, a change in the connecting cable, and one change in the printer hardware configuration will take care of it.

Make a copy of the CP/M disk and do not write-protect it. All changes will be made on this copy disk. After booting the disk, the question is asked (after a brief commercial about the computer): STANDARD SYSTEM (Y OR N)? Type the character "N".

A list of options, called the main menu, will now appear on the screen lettered from "A" to "Z". When you then type "A", another list—a sub-menu—will appear. (See page 100 of the Heath section of the CP/M manual.) Again there will be choices from "A" to "Z". The printer comes from the factory with the baud rate set at 1200 so under "C" the baud rate for LST should be changed to 1200. It should read: "C LST: Baud rate: 1200 Port: 0E0H = 340Q". This is accomplished by typing "C", and then making the changes in the line which appears at the bottom of the screen.

If your screen has been displaying capital letters only, you should find that option "F" reads TRUE. It needs to be changed to FALSE. Simply type "F" and RETURN. The menu will reappear on the screen and "F" will now be FALSE. If this isn't done, you will have a wild time doing word processing with all capital letters. (Actually, "F", "G", and "H" should all be FALSE.)

The PRINTER READY signal expected by the H/Z89 is the opposite logic level from that used by the TP–1. On the same sub-menu there is the choice "M". If the last word on the line is LOW, type "M" to toggle the logic level to HIGH. This will correct that problem when using CP/M.

When these changes are made, type "Y". The screen will then return to the main menu. Type "Y" again. These changes are now permanently made on your copy disk.

When configuring the Magic Wand disks, under CHANGE select printer option 3—"WH–24–1, TI–810, (all other printers)".

Next comes a possible change in the wiring of the connecting cable. The DB–25 connectors have to be wired "one-to-one." That is, pin 2 on one connector goes to pin 2 on the other, and pin 3 goes to pin 3. These are not swapped as they are in some cables. Actually, a three-wire cable would be sufficient with pins 3, 4 and 7 wired. However, having the other pins wired causes no harm.

A hardware configuration change needs to be made on the printer. The directions for this are not in the operator's manual where they should be. To get the instruction sheet titled "TP–1

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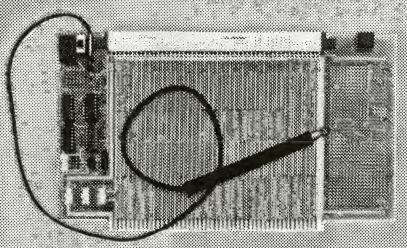

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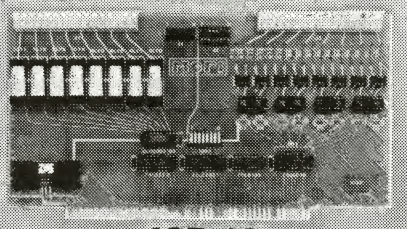

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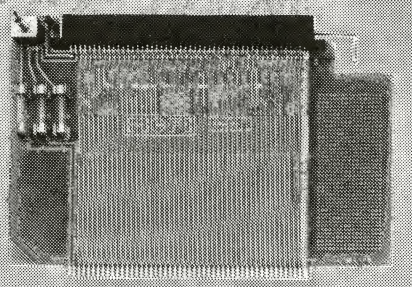

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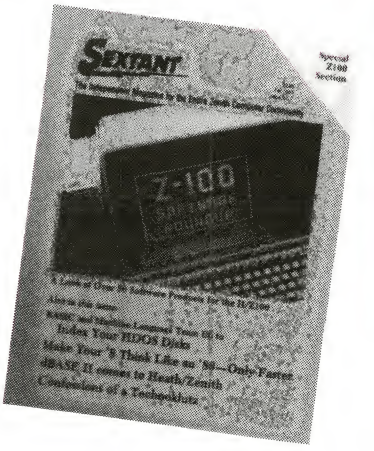

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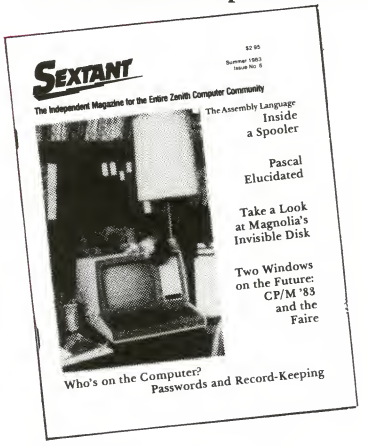
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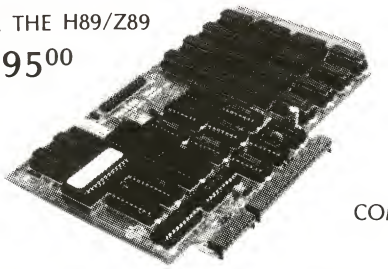

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Serial Switch Selection," write to Smith-Corona Consumer Products, 3695 Erie Boulevard East, Dewitt, New York 13214, or phone 315/446–3550. (I wrote to the New Caanan, Connecticut, address given in the operator's manual and never did get a reply. Finally, after two months, I found the name and address of the General Sales Manager in an ad and wrote to him in Connecticut. He forwarded my letter to the Dallas office. They sent me a letter saying they sent it back to the home office to a "Mr. Gutman, who knows all about printers." A month later, I received a letter from a Dewitt, New York, address saying my answer was on the way. I received the information the following day, not from Mr. Gutman, but from Mr. Charles A. Molloy.)

The H/Z89 does not send out the parity bits used in error detection. But the TP–1 is configured for even parity. So that will have to be changed. The instructions for removing the case to get at the parity switches were not completely clear and no sketch was provided. For instance, one instruction says "Snap the three Ball Fasteners at the rear of the Casing Top out of the Clips of the rear of the Casing Base." What that means is that after all visible screws are removed, the case still will not come off. Using a thin blade screwdriver, the top must be pried upward along the back edge of the printer until it releases from the base. Nevertheless, by following the instructions given in the sheet, and using much care and restraint so I would not wreck it, I removed the case from the printer and found the serial selection DIP switch. All that was required was to turn switch 2 ON. (It's the second switch down as viewed from the top.)

During the months I waited for a reply to my letter, I found another way to use my printer with CP/M by experimenting with a CP/M utility called "SETLP". For some reason, which I don't understand, this setup will permit the printer to operate correctly even when the parity settings do not agree. On CP/M Disk II I found SETLP.COM and copied it to my working disks. Whenever I wanted to print, I would type SETLP 1200 after the "A" prompt when booting the system. (When I forgot to do it, which was often, the printer would go berserk. It would print the wrong characters and underline about half of them. It looked the way they used to depict swearing in the comic strips.)

The serial selection DIP switch can also be set for different baud rates from 50 to 19,200.

When I tried word processing, everything followed the Magic Wand book except underlining. The TP–1 underlines each character individually by a "type-backspace-type" routine. To accomplish this, you must send the ASCII character "EM" (Hex 19) to the printer. (EM is the same as Control Y.) All characters printed following the receipt of the EM character will be underlined. Receipt of another EM character will halt the underline mode and return the printer to the normal print mode.

There is only one problem with that. In the Heathkit book where the ASCII character set is shown, EM is in a shaded area which indicates that it is not processed by the computer. However, in the Magic Wand instructions it states that any ASCII character can be sent to the printer by using the OUT command followed by the *decimal* code. This includes those which cannot be "processed" by the computer. The decimal code for EM is 25. When editing a Magic Wand manuscript, to underline a word, precede it by OUT25 and follow it by the same. For example, to underline the word "computer", the line on the screen would look like this:

OUT 25 computer OUT 25

In that the TP–1 is a single-sheet feeder, you will soon get acquainted with the FORMS command in Magic Wand. It keeps you from typing your manuscript on the platen after the paper has run out.

To use the TP–1 with the Heath Disk Operating System (HDOS) instead of CP/M, some means is needed to invert the logic level of the RTS (Ready To Send) signal. It must be HIGH when the printer is not busy. Smith-Corona will provide a sketch for a circuit change to the IC circuit board to accomplish this. After studying the board and reading the rather vague instructions, I decided a software change would be a lot safer. A software device called a "Universal Device Driver" not only can take care of this but also can be used to set the baud rate to 1200. A universal device driver sounds like some gadget you add to the computer but is actually a program supplied on a disk. The cost for UD.DVD from SoftShop is $29.95. (SoftShop, 35 Shadow Oak Drive, Sudbury, MA 01776; 617/443–9693.)

And so forth

It is one thing to get a printer running on line, and another thing to keep it running. Suppose you have printer trouble, who will fix it? There is one thing for sure: when you get the TP–1 (or any other printer for that matter) do not throw away the box. You may need to return the printer to the manufacturer for repair. My area Smith-Corona dealer assures me they can repair it. Maybe they can, but that was the same dealer who did not know what the "TP–1" was. However, I did find an independent typewriter repairman who had worked on several of them. The "Operator's Manual" offers this advice, "If the printer needs service, consult your source of purchase for appropriate servicing." The TP–1 is guaranteed for 90 days and should be returned to one of their regional repair centers which they claim are "located in key cities throughout the country." There are actually about six of these repair centers. Is this any different from the "big name" printers? A call to several computer shops concerning repairing Diablo and NEC printers indicated that they handle things about the same way. All they do is return them to a regional factory repair shop, or to the manufacturer. The best bet is make sure you can live with the service arrangement before buying the printer. As the new Smith-Corona electronic typewriters become more popular, local repairs should be available because the TP–1 is simply their electronic typewriter without a keyboard.

How do I rate the lowest priced daisy-wheel printer on a scale of "zero-to-10"? For business use in an office I would give it a "1." It is too slow! For home use, I would give it at least an "8."

It is ideal for the writer on a limited budget or for the computerphile who loves to write letters. It has not been on the market long enough to gauge its durability or how well Smith-Corona will stand behind it; but if it is anything like my old Smith-Corona typewriter, it will run for the next 35 years. For the economy-minded, the H89/TP–1 combination makes a full-blown word processor with a letter-quality printer for about $2,000. I ought to know, I wrote this article on it.

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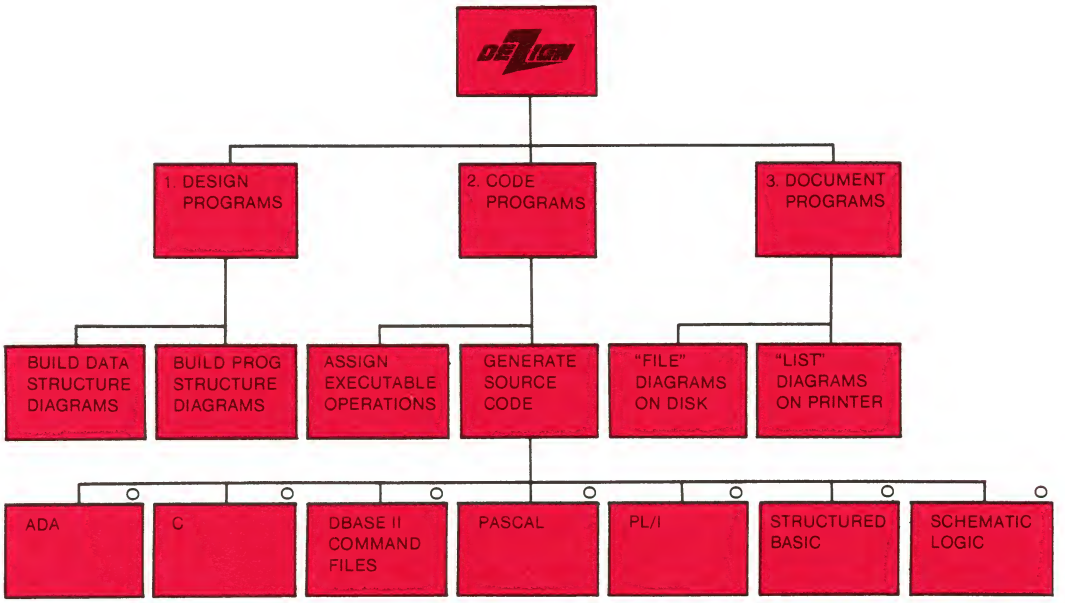

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Circle #180 on Reader Service Card

The '89 Goes to College

St. Olaf College created a distributed processing network by putting together H89s running HDOS and a mainframe running the Unix operating system.*

Lynn Arthur Steen

"You mean you build them? From a kit? What are they—some kind of toy?"

At first, visitors find it hard to take seriously. But a few minutes in one of our "microrooms" is very convincing: all around the perimeter are students busy at the keyboard. Some are writing papers for English or History courses; others are writing programs in BASIC or Pascal (or even C); a few are filling the screen with strange-looking tables, hexadecimal code from sectors of the disk. The white noise of constant keyboard clatter (a modern equivalent of the soothing klickety-klickety-klick of an old-fashioned railroad ride) is suddenly interrupted by the staccato of a printer in one corner of the room, jumping to life in response to a request from one of the keyboard artists sitting with their backs to the visitors.

These kits are not toys: they are H89 computers. St. Olaf College both builds and repairs them in a specially equipped electronics shop. There are now over 50 H89s in different areas of the campus, owned and operated by the College. In addition, more than a dozen members of the faculty own H89s in their homes (many have built them themselves), and untold numbers of students have purchased H89s for use in their dorm rooms. All these purchases are aided by a special bulk purchase discount that the local Heathkit Electronic Center provides to the College, to its faculty, and to its students.

Picking a microcomputer

St. Olaf's commitment to H89s developed several years ago, at the time our main academic computer—a PDP 11/70 from Digital Equipment Corporation (DEC)—was becoming overloaded. In 1980, we had 64 terminals and printers attached to the 11/70, which was running the Unix operating system. The 11/70 with Unix worked beautifully, but it couldn't be expanded any more and we didn't at that time have the capital required to upgrade to DEC's VAX computer. So we decided to purchase a suitable microcomputer that could relieve the load from the main system by absorbing much of the keyboard time for text entry and elementary programming.

At that time Minnesota, under the influence of the Minnesota Educational Computer Consortium (MECC), was agog with the Apple II. Our criteria, however, pointed to the H89 as a far better alternative for the kind of serious work required in a liberal arts college. We wanted:

—a professional keyboard with full ASCII input;
—an 80-column screen display;
—a software operating system with some of the flexibility of Unix;
—access to the CP/M operating system;
—complete details on hardware and software to make possible advanced computer science projects.

The H89 met these criteria, and at a good price. Thus began St. Olaf's addiction to Heathkits.

Linking Unix to HDOS

The first H89s that arrived on campus worked beautifully—as stand-alone personal computers. But that wasn't enough: we needed them linked to the Unix system on the PDP 11/70. We did this by writing a program that we called "terminal": it made the H89 emulate a terminal on the Unix system, with the ability to transfer files from the H89 disk to the user's Unix account (and vice versa). Early versions of "terminal" were written in assembly language under the Heath Disk Operating System. Later and more sophisticated versions were written in C. The latest revision of this program, now available on both HDOS and CP/M, is a very versatile piece of software that effectively makes the H89s into satellites in the St. Olaf Unix system. In the jargon of network theory, "terminal" creates a star network for the St. Olaf campus. (Yes, by the way, Unix program names are given in quotation marks and all lower case—unlike the all upper case names to which most Heath/Zenith users are accustomed.)

Anyone who runs "terminal" can reset and catalog disks without returning to the HDOS operating system, can copy Unix transmissions to either a disk file or an attached printer, can change baud rate (to enable "terminal" to function with a modem), and can run Unix programs on files that reside on the H89 disk without

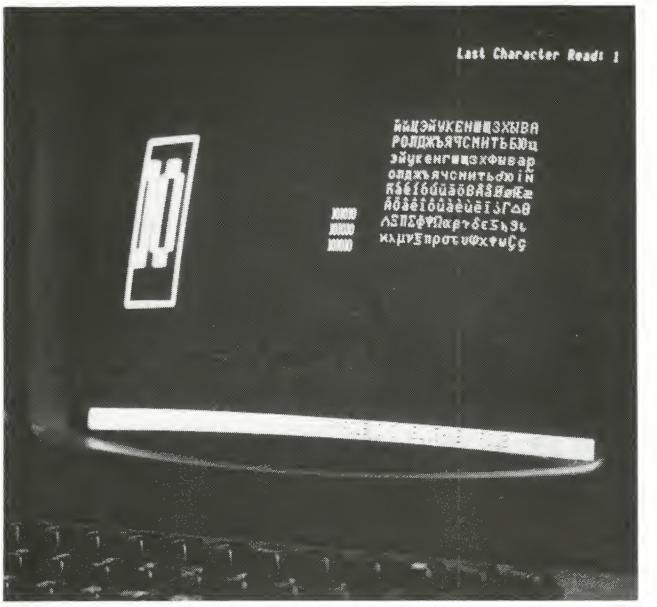

Photo Courtesy of Dr. Lynn Arthur Steen

Using software developed on campus, St. Olaf's H89s have no trouble handling alternate character sets. Learning Russian or Greek may be just as hard as ever, but writing them is now a lot easier.

*UNIX is a trademark of AT&T Bell Laboratories.

first saving them in the user's account on the Unix system. All this is done with the special function keys on the H89. For example, key "f1" will initiate the process of sending a file from the Heath disk to a Unix account: it will ask the user for the names of the source file and of the destination, then transmit it as instructed. The "f2" key does the reverse, transmitting files from Unix to HDOS.

The "terminal" program makes it feasible for students working on papers or programs to prepare their material on an H89 disk yet still process or compile them on the Unix system. In 1982-83, two years after St. Olaf began development of the H89 satellite system, about one-third of all campus computing took place on the H89s: 40 H89s supplemented 80 Unix terminals to serve a student body of 3,000.

Emphasis on text editing

Because St. Olaf is a liberal arts college with traditions in the humanities that are every bit as strong as those in the sciences, computer policy at the College has supported humanities use as strongly as scientific use. Since the major student activity in humanities courses involves writing (themes, term papers, research reports), the major programming support for the H89s has been addressed to this need.

Text editing on Unix is accomplished in two steps—creating files with an editor (usually "ed" or "vi"), followed by processing via a "runoff" program that reads special command lines in the file to set margins and format the text. To maintain compatibility, we decided to emulate this procedure on the H89s. Instead of using elaborate software tools such as WordStar, we emphasize simple editors like PIE. The important thing is that the user (whether on Unix, on HDOS, or on CP/M) must be able to create a text file with embedded formatting commands of the sort used in Kernighan and Plaugher's *Software Tools*. These commands typically are lines beginning with a "dot" and followed by two letters; for example, ".pp" is used for paragraph, ".ul" for underlining. After a file is created which contains all necessary instructions for formatting, it is then processed by the "runoff" program that is itself a shell of formatting definitions called "macros" surrounding the central Unix text processor "nroff".

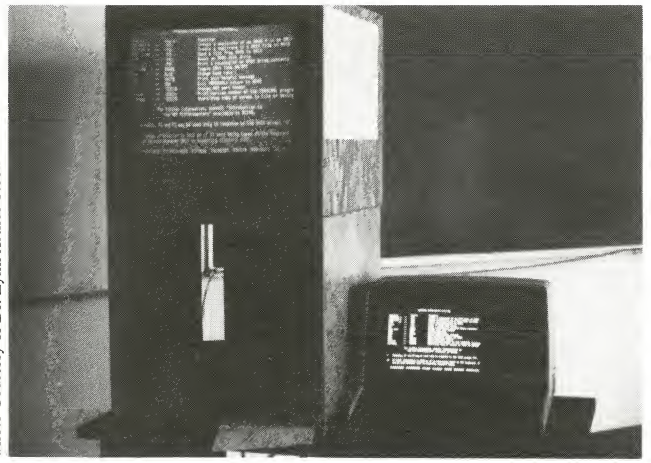

Photo Courtesy of Dr. Lynn Arthur Steen

The addition to the H89 of a locally designed remote video output board allows the contents of the screen to be displayed on a television monitor (left). The instructor can thus demonstrate computer use from the keyboard without blocking the display.

In a college environment, the requirements for a text editor are enormously diverse. Some need the ability to enter and print foreign language text or to use footnotes, endnotes, and margin notes; others need tables and graphs, while still others need mathematical equations. By building libraries of macros—complex formatting commands built up from simple primitive ones—we are able under the Unix system to satisfy most of these needs. But the H89 could not run Unix, nor could it manage files of the size required for text processing of this complexity.

However, most student use of text editing does not require more than 10% of the features of the full system: freshman English themes and philosophy term papers are typographically rather tame, and do not change much from year to year. So we wrote (in C) a "runoff" program for the H89 that would replicate exactly a simple subset of what the Unix system under its powerful "nroff" program could do. (This program is similar in spirit to The Software Toolworks' print-formatting program TEXT, but differs in details in order to make it identical to our Unix implementation of "nroff" macros.) The C-language version of "runoff", a subset of the full Unix "nroff/runoff" system, gave us a two-tiered system: elementary "runoff" that runs on both the H89 and Unix in identical formats, and advanced "runoff" that runs only on Unix and handles specialized macros.

The effect of "runoff" on the user community has been enormous: students and faculty can now prepare their written material on either system and know that it

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will work on the other without any change. Even those who need the Unix processor for advanced macros can still enter their original text on the H89, and then use "terminal" to send their text to Unix for processing with the advanced "runoff".

Using Unix tools on the H89

The combination of "terminal" and "runoff" produces a computing environment in which the H89s stretch the Unix resources far beyond the normal limits of a time-sharing system. In a typical editing session, a student in a freshman writing course, Mary Johanssen, for example, may spend two hours at an H89 using an editor like PIE to write and revise an essay, embedding in the essay the appropriate "dot commands" for formatting with "runoff". During all this time the H89 is not bothering the time-sharing system at all.

After the essay is saved on the H89 disk, Mary can run "terminal" to log in to Unix. Then, if she wishes, she can run the Unix programs "diction" and "style" to get an analysis of her essay, together with a list of infelicitous expressions that she may wish to change. She can also run "spell" to check for typographical errors and misspelled words. Since her file resides on the H89 disk, this is accomplished by the "f3" key on the H89 which "terminal" uses to transmit information to Unix processes. After receiving the list of potential problems, Mary can return to PIE (or whatever editor she is using) to revise her phrasing and correct her typographical errors.

If her file does not contain any advanced macros, Mary can then process it with the H89 program "runoff" to see on the screen how it will appear on paper. If all is well, she can then re-run "runoff" and direct the output to the device (or file) name "LP:" to get the paper printed.

If, however, she had put into her file some advanced feature such as commands for a mathematical equation, the file would have to be processed on Unix. This she could do either by transferring the entire file to her Unix account (via the "f1" key) before processing, or by using the "f3" key to have the Unix advanced "runoff" program read the H89 disk as its source of input. In either case, the result would be a file in her Unix account that contains the formatted output. This output file could then be printed either by retransmitting it to the H89 and directing it to the device "LP:", or by using the Unix "print" or "que" command to send it to a line printer attached to the time-sharing system.

In this entire process, the H89 provides about 90% of the terminal time on its own. The scarce resources of the time-sharing system are used only when needed—to check spelling against a large dictionary, to process and format specialized material. This arrangement makes H89s very cost-effective, because every time they are used, valuable central-processing unit (CPU) time on the time-sharing system is made available for more specialized functions.

Learning to program

The symbiotic relationship between the H89 and Unix extends as well to the area of programming languages. As text editing spans a broad spectrum of complexity, so student programming ranges from 10-line programs in BASIC for beginners to 25 pages of assembler or C code for staff programmers working on large projects. Here, too, we encourage appropriate use of computer resources: use the H89 for what it can do well, and link to the time-sharing system for advanced processes that the Unix system can do best.

The H89 can provide resources for entry of source code for any program, whether intended for compiling on the H89 or on Unix. Students learning to program spend a lot of time at a terminal thinking (rather than compiling), and tend to write relatively simple programs. So we encourage everyone learning BASIC to do all their work on the H89. More advanced students who are learning FORTRAN, Pascal, and C can also use the H89 for programming, either for a language compiler available on the H89 or for one on the Unix system.

Sophisticated programmers can continue to use the H89 text editor to write source code for programs that will be compiled on the Unix system. After the source code is completed, it can be transferred to the time-sharing system for processing, using the "terminal" program in the same way it is used for word processing. Since students can choose whether to save their files on H89 disks or on their Unix accounts, not only time for text entry but also storage resources are saved on the time-sharing system.

Build them yourself

College budgets are always very tight. When we started our microcomputer expansion, we needed to get as many H89s as possible from the limited funds available. The kit price of the H89 was an enormous attraction, but building lots of kits is quite a chore. We did have on our staff an electronics technician who looked after minor computer repairs, however. So he set up a cottage industry of kit-builders in nearby Northfield. Some kits were built by our technician, others by students or former students working under his direct supervision. Overall, in a two-year period, we assembled about 40 H89 kits and as many H19 terminal kits; this summer we built another dozen H89s, and about 50 new H29 terminals.

As kits are built, so can they be repaired. Some had typical burn-in problems; others occasionally broke down in heavy use. Our electronics service center

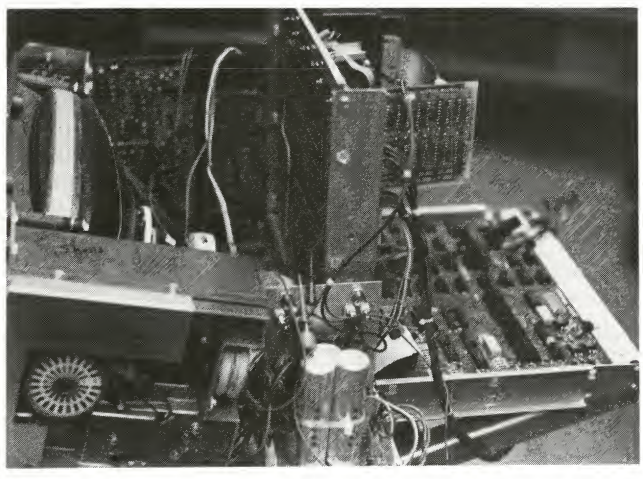

Photo Courtesy of Dr. Lynn Arthur Steen

This H89 test rig was built in St. Olaf's electronics shop. Designed to be easily built as a kit, an '89 is already convenient to work on. An "exploded" unit like this goes further: boards can be popped in and out for quick testing.

stocks most H89 parts and uses a special "exploded" H89 to swap boards for quick diagnostic tests. In one famous incident, students left three H89s running in a small room all weekend during the summer when the air conditioning was off: come Monday morning, all three were dead. By Monday noon they were all operating again, with quick diagnostic work and replacement of a few burned out chips.

Overall, in a two year period, we assembled about 40 H89 kits and as many H19 terminal kits; this summer we built another dozen H89s, and about 50 new H29 terminals.

By now, our electronics staff has grown to two, being responsible not only for the H89s but also for the 100 or so terminals linked to the central computer. Many of these terminals are H19s, so the knowledge and parts from the H89 project transfer immediately to these terminals. We are now beginning to build a base of expertise on the H29 terminal, since our electronics shop has supervised construction of nearly 50 H29s for our new VAX computer.

The experience gained in this build-and-repair operation has also made it possible to develop customized hardware adaptations for the H89s (and the H19 and H29 terminals). These include a special video output board, special character read only memory (ROM) chips, and special links to laboratory experiments for data collection and control purposes.

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Modelling and simulation

In 1980, St. Olaf College received a grant from the National Science Foundation (NSF) and the National Institute of Education (NIE) to develop prototype materials for using microcomputers in innovative ways for secondary school mathematics instruction. The project emphasizes simulation rather than computer-aided instruction (CAI) as a strategy for learning: the computer is used to simulate events that produce patterns suitable for mathematical analyses. Students can use these programs to gather and analyze data, to formulate conjectures, and to test hypotheses in a wide variety of high school mathematics classes.

Naturally, we decided to use the H89 as the microcomputer for this work, supplemented with Xcel graphics boards from Maxtek, Inc., to make possible medium resolution graphics. One prototype uses a bouncing ball to simulate deterministic phenomena; another uses a variety of waiting lines (barber shop, car wash, etc.) to simulate a stochastic phenomenon; and a third uses mathematical functions such as the Fibonnacci series to simulate recursive phenomena. To add to the variety, we use three different programming languages for the three projects: C for the bouncing ball, BASIC for the waiting lines, and MuSimp for the recursive functions.

Project development was carried out by student and staff programmers working under the supervision of members of the Department of Mathematics. As a spin-off benefit, the work involved in this project led to development of graphics software for the Xcel-equipped H89s that makes possible a very effective classroom display of computer output.

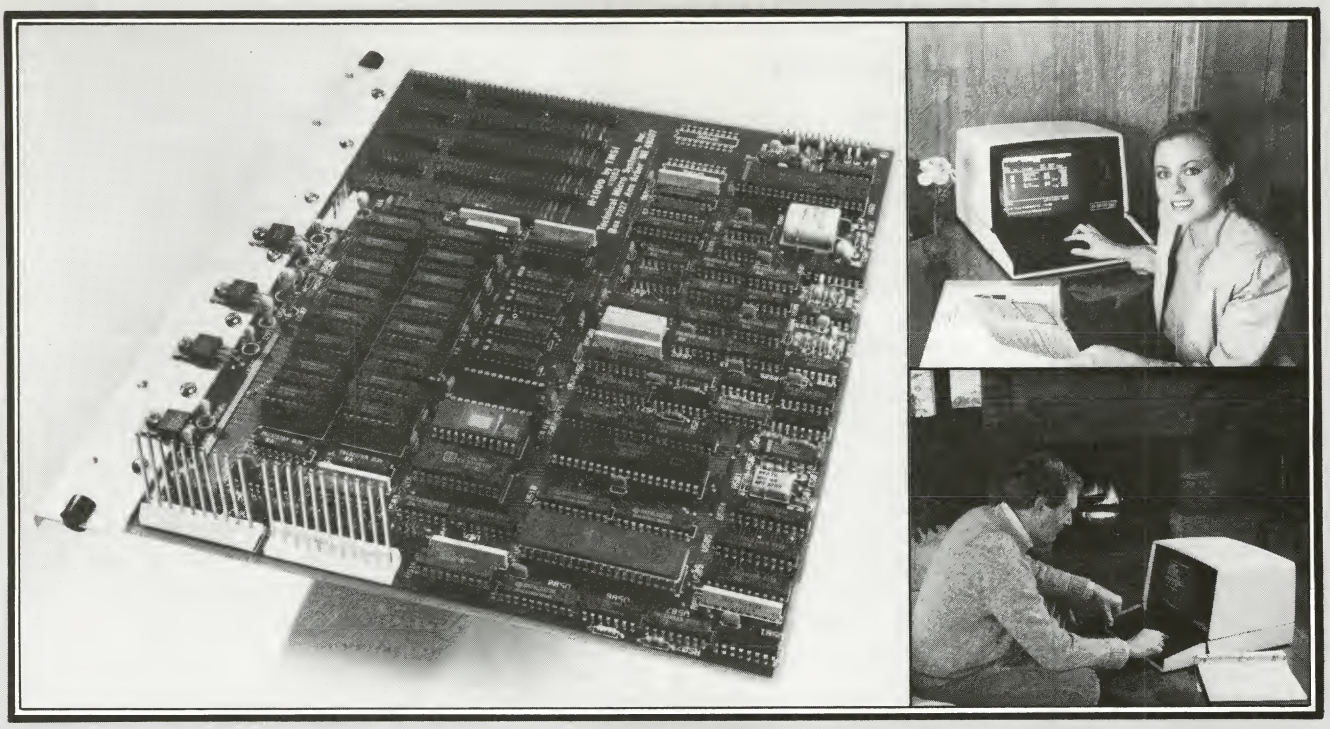
By modifying the "terminal" program that links the H89 to the Unix system, we were able to make the H89 use the graphics board to draw large characters—40 per line, 16 lines per screen (just like an Apple!)—rather than simply produce the normal characters provided by the character ROM. Then by adding a locally designed video output board to the H89, these large characters can be displayed on a television monitor that can be read from the back of a modestly sized classroom. (Regular sized characters, even when enlarged for 21-inch monitors, are not legible beyond 10-12 feet.) Another variation on "terminal" made it possible to take high-resolution graphics output from Unix coming down the wire in Tektronix code and display it on the graphics-equipped H89s.

Here, too, with the addition of a simple graphics board, the H89 extends the power of the Unix system to make possible an essential educational function: showing computer use in classroom settings.

Parlez-vous Français?

One feature of the H89 that appealed to us from the beginning was its versatility: the complete availability of schematics, of parts, and of operating system code made it possible for advanced students to use the '89 for various special projects. An early effort at individualization led to a French-speaking H89.

The goal was simple: adapt an H89 to CAI in French. The problem is, of course, that French uses



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HDOS 2.0 compatible	no	no	yes	yes	yes
CP/M compatible	yes	no	yes	yes	yes
Runs all H89/Z89 software	no	no	yes	yes	yes
Supports all H89/Z89 hardware	no	no	yes	yes	yes
8-bit clock	5MHz	none	2MHz	4MHz	2/4MHz
16-bit clock	5MHz	4.7MHz	none	none	8MHz
Maximum memory	756k	756k	64k	256k	1048k
Runs MS—DOS and CP/M-86	yes	yes	no	no	yes
color graphics	yes	yes	no	no	no
price/performance	ouch	ouch	good	better	best

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accents and other diacritical marks that are not available either on the keyboard or on the screen of the H89. (They are, however, available on the NEC Spinwriters that we use for printing—with a French thimble.) So we plunged into electronics, and designed a new character ROM that substituted for certain symbols (such as | and @) the necessary additional French characters (such as "ê" and "ç").

First, through careful negotiation with the faculty in the French department, we designed a pattern of keyboard substitution that replaced certain symbols on the regular H89 keyboard with special French characters. Since they needed 14 special symbols, and could only sacrifice about 8 of the regular symbols, the remaining 6 were set up as two stroke sequences. (For example, an "o" followed by " produces the dieresis o, occasionally used in French.)

Then to make it all work, we wrote a special version of the "terminal" program that managed the necessary translations between keys that were pressed at the keyboard, codes that were required to be sent to the screen to display the correct French symbols, and codes that were required to be stored in the file for printing compatibility with the "runoff" system. The effect is a French-speaking H89, with a translator built into the "terminal" program that makes it possible to communicate properly with Unix which, alas, still speaks only English.

It's Greek to me

The success of the French project whetted the appetites of students and faculty in the other language areas. So, building on the lessons learned from this first exploration into bilingual computer education, we are now embarked on a multilingual effort that covers most European languages. The goal is a versatile text editing system that can easily shift from one language font to another, display on the screen in the appropriate language, and store (on the disk file) code that can be easily understood by the Unix "runoff/nroff" system for subsequent printing.

The key to this system is an inexpensive hardware modification that makes it possible to display, in addition to the regular printing characters, 128 custom-designed symbols for foreign language use. These symbols take the place of the reverse-video normally available on the H89. (The new character ROM is designed to work on the H29 and H19 terminals, as well as the H89.) Careful analysis of European languages shows that all major accented letters, Greek and Cyrillic characters, and special punctuation marks can, with only a few compromises, be accommodated in this 128 character expansion.

Our design calls for a special PIE-like editor, written in C, that will automatically shift into special foreign language fonts whenever the appropriate "runoff" codes are typed at the keyboard. For example, we use "`gb" to signify a font shift into Greek, with the "b" representing the Greek "beta". (The escape character sequence "@g" will lock in Greek until unlocked, whereas "`g" affects only the subsequent character.) When a special font is called, the keyboard will be automatically mapped into the appropriate language—modelled after the French keyboard described above—and the new editor will then translate what is typed at

the keyboard into appropriate code for proper display on the screen of the various foreign characters.

Will the H89 survive?

St. Olaf students and faculty often use the H89s with standard software for standard things—WordStar for writing papers, SuperCalc for accounting, dBASE II for organizing information. They also write programs in BASIC, FORTRAN, Pascal, and C; use the H89 as an intelligent terminal for communicating with various data banks; and explore Z80 assembly language as part of introductory courses in computer science. While these applications are frequently new to the students and therefore represent important learning experiences, they do not in themselves elevate the H89 to special status in the St. Olaf computing environment.

What makes the H89 system work is its effective link to a central Unix facility. This fall, that central computer was expanded via Ethernet to include both a VAX 11/780 and the PDP 11/70, each running Unix, and each linked via the "terminal" program to the more than 50 H89s located around the campus. (We added nearly 50 H29 terminals—built by our cottage kit-building industry—to access the VAX.) Still, despite more and more central computing power, there remains an important role for distributed processing that the H89s provide. At the same time that we added the VAX to the Unix system, we also added a new room full of H89s to support the hundreds of students who must write themes and reports every week.

All the talk in the computer world is now focused on 16- and 32-bit machines. For scientific computation and graphics, 8-bit machines such as the H89 cannot compete with this new generation. However, most keyboard and terminal time on almost every undergraduate project is spent in typing: whether it be words in an essay, lines in a program, or numbers in a data file, the things that go into the computer are put there by human fingers at a keyboard. And for this type of work, 8-bit micros such as the H89 are ideally suited: they are fitted to human needs in scale and cost, and are not encumbered with features rarely used in ordinary student work. We expect the H89 will be the workhorse of liberal education at St. Olaf College for as long as the machines are available.

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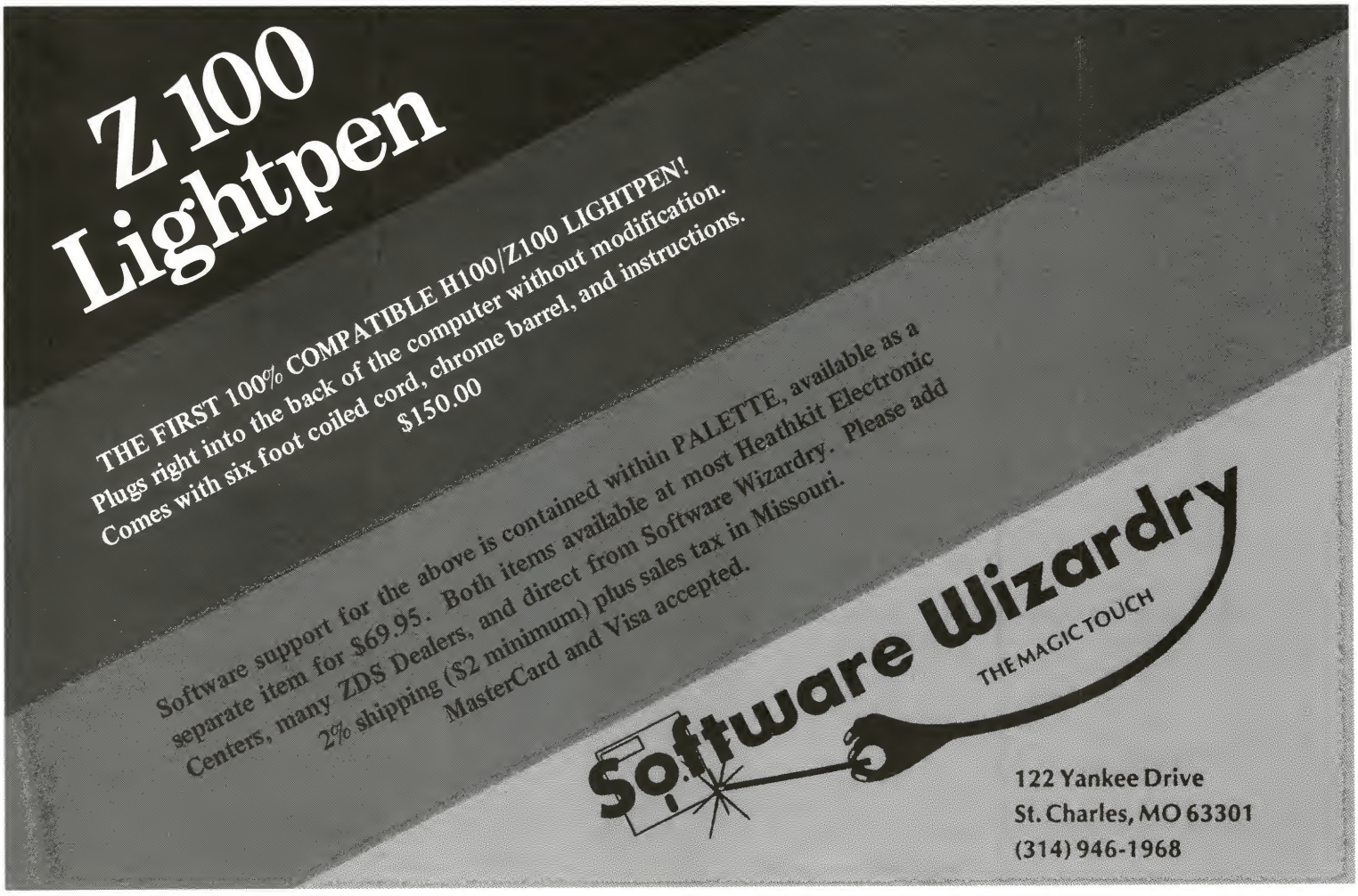
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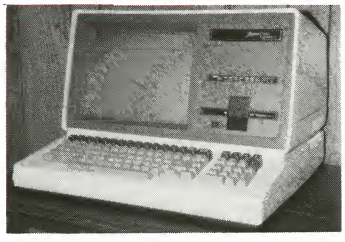

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Tracking Home Finances with the Home Finance System

The Home Finance System has features one would normally expect to see only on more expensive business software.

Steve Howard

With the economy in the shape it has been, have you ever found yourself wondering how much you have spent on food? Or how much you have spent on software for your computer over the last year? Have you ever wondered whether you sent in that magazine subscription but couldn't remember the number of the check or when you paid it? Have you ever wished for an easier way to reconcile your checking account? Have you ever wished for an itemized listing of your medical and tax-deductible expenses for the past year?

I always felt my computer should be able to handle chores like these for me. Ever since I first bought my H8 a few years ago, I wanted to use it to try to make some order out of the mess I jokingly call my budget.

I had some accounting in college. And since my wife is an accountant for a major corporation, I thought it would be a snap. But I was never able to find the software I needed in one package. It had to be detailed enough to be of use at income tax time. And yet its operation had to be convenient for my wife (who is not a computer enthusiast).

In my search for the Holy Grail of finance programs, I entered some programs from computer magazines, ordered a few from various users' clubs, and even tried buying some commercial programs. Most of these had a few good points, all had a few bad points, and a few would not even run! None of these came very close to including all the options I wanted.

I had resigned myself to writing my own program, when I got a call from the manager of the local Heath store telling me of a new finance package that had just come in. I was sure it was just like the rest and would not really deliver what I wanted in a finance program at a price I could afford. Boy, how wrong could I be!

The Home Finance System (I'll call it HFS, here) is written in Microsoft BASIC by Dr. Jay Gold of Des Moines, Iowa, for Heath's H/Z89 computer or programs from computer magazines, the H8 with H19 terminal. HFS requires two disk drives, a minimum of 56 kilobytes of random-access memory (RAM), and version 2.0 of the Heath Disk Operating System (HDOS).

It assumes the use of an H14, an MX–70/80/100, a TI 810, or a Diablo printer for hardcopy output. However, if a different printer is used, the program has provisions for installing your own device driver when configuring HFS. Easy-to-follow configuration instructions are given in the documentation to help you through the early stages, making the initialization of your HFS disk as painless as possible.

In my case, it really helped to see how easy it was to let my "plastic money" get way out of hand—and stop it before it was too late.

(HFS has been around for a little while now. Dr. Gold has recently released Version Two and Version One is no longer being sold. Version Two is basically the same as the original with some very nice additions and improvements. I'll note them as I go along.)

Documentation

The package is well written and documented, consisting of a vinyl three-ring binder to hold the documentation, and a set of six diskettes. The documentation is professionally printed, and very easy to read. This is a marked improvement over the previous version, and looks very professional. Four of the diskettes are program disks, labelled Finance A, B, C, and D. The two remaining disks are titled "Start-up" and "Sample Data." The Data disk will help you familiarize yourself with the system, and will provide you with a beginning data base with which to create your own data disk.

The manual has a very complete Table of Contents, making it very simple to find a chapter or subject you're interested in. The easiest way to learn HFS is by using the sample data disk and stepping through the manual.

Starting out

When you first start with HFS, you are instructed on how to bring up your own bootable HFS disk and your system data disk—which will keep all of your data. The instructions then go on to show you how to install your own printer driver, should you be using a printer other than those which Dr. Gold supports. This seemingly complicated procedure is made extremely painless, and works great. As HFS is working on preparing your disk, it keeps you informed of what files are being added or deleted by messages on the screen. You are never left wondering whether something is being done, or whether the system is just hung up. Many programs on the market simply leave you to guess when the system is doing some calculations or other such busy work. I like being informed of ongoing activity.

A new feature found in Version Two is the ability to use high-capacity disk drives (the double-sided, double-density type). Dr. Gold carefully explains the use of the high-density drives, and points out that if you use this type of drive, some of the messages on the screen asking for a particular disk may be incorrect. If you are condensing the program to one or more 80-track disks, you should be aware of this difference anyway. He even makes some useful suggestions on how to set up a system using these drives, such as which files should be on a system disk, etc. A list of files and the disks they are expected to be on is provided to help you decide where to break them up when using 80-track drives.

When setting up your HFS disk, you are able to define your own budget codes or use the codes supplied by the author. You can also change them at a later date should you choose to for any reason. A maximum of 30 codes is allowed, but I have found it difficult to use even 20 of them in my budget. Each code has a text name and a number from 1 to 80. This allows the categories to be spread out with room allowed for future

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additions to your account file. The program allows additions, deletions, editing, and the display/print of the codes. The display/print option gives you the choice of showing the codes on your screen display or sending them to your printer. This allows a printout of the codes when you have set up your HFS, and yet allows you simply to display them on the screen if you wish.

HFS comes with a special section called "Utility" which helps make all those little unforeseen changes that occur during the year. With the Utility section, you can add a new bank, change the bank you have listed as "active," and add a new check file. It helps you set up a new data disk with no previous balance.

HFS even checks the disk status of the data disk. To let you keep tabs on how full the data disk is becoming, the number of free sectors is always displayed and updated in sections where you add data.

Finally, HFS includes one of the most useful features of any budget program on the market, and one that is normally seen only in business accounting programs—its printout capability adds a lot to the program. The system will print out checks for you on the printer. It will print out several reports for you showing how your accounts are doing and what your check register looks like. It will give you a list of checks written to a particular account and show you your budget expenses over the year with the accumulated totals by month. And there are several other very useful accounting formats as well. The printout feature alone makes HFS worth the money when tax time rolls around. I feel nothing impresses the I.R.S. more during an audit than having all of your facts straight and supported by printouts documenting your claims.

The program provides for maintaining your checkbook. It takes care of balancing your checking account, and editing or changing checks prior to printing them out (or after printing them, if you need to). It lets you record bank deposits, bank charges, and Instant Cash entries (Visa, etc). A complete allowance for savings accounts has been included. HFS allows for up to 60 asset accounts, and has provisions for deposits, withdrawals, interest entries, and transfers from savings to checking and from checking to savings. Provisions have also been made to flag checks as medical expenses, as tax-deductible, or as falling in some other category you need to keep tabs on. Deposits to checking and asset accounts can be similarly given code numbers (0 through 6) and they can be flagged as taxable or non-taxable. Again, this comes in handy at tax time for printing a list of things like all tax-deductible and medical expenses.

HFS allows for two banks, only one of which is active at one time. The benefit of the capability is that if you should move, it allows the addition of the new bank. This means you can have only one checking account active at a time. The checking account, however, can be tracked by three check *files*. This allows three check registers that all draw on a single checking account. In this way, I can carry a checkbook, my wife can carry her own, and the computer can also keep track of the checks that it prints.

The program is menu-driven and continually prompts the user for whatever information or action is required. When a new disk is needed, a reverse video prompt comes on the screen. It tells the operator which disk is needed and which drive to put it in. It automatically resets the particular drive being used. Due to the clarity of these messages, I found this feature very useful for allowing other members of my family to operate the system with little difficulty. They were never in doubt as to which disk to use, or which drive it was to be placed in.

Section by section: it offers a lot

There are 12 sections to HFS. The first section is called *Checks/Deposits/InstCash/Bankchg*. This section is the one most heavily used on a day-to-day basis. It is in this section that checks you want to write are entered into the computer's "check register." The computer asks for the date; the name of the payee; the amount of the check; your budget code for the check; whether the expense is medical, tax-deductible, or other; an optional comment if you wish; and whether it was returned or not. The last entry is used when checking off the checks returned from the bank at the end of the month. Your deposits, Instant Cash withdrawals, and bank charges are all entered in this section, too.

But what about those checks I write that really fall into more than one of my budget categories? Well, HFS even allows the check to be split up into more than one budget category. I have not seen this feature on any of the other finance programs I have looked at.

The *Alter/Void* section provides a method of altering or voiding the checks, deposits, Instant Cash, and bank charges entered under the first section. In effect, it is an editor allowing you access to the check data base for correction.

The *Credit Accounts* section is another of the more useful sections of the program. You are allowed up to 60 accounts in your account index. The account index is nothing more than a list of the name of the account together with its account number. This section is actually like a 60-page record book, with each of the pages representing a particular store, credit card, person, or anything else that holds an account for

you. It is here that you keep track of all payments, charges, finance charges, amounts paid, and balance after your payment. Also on the page will be the current balance, the total amount paid to date, and the total finance charges paid to that account for the year. This section is very useful for any account on which you make regular payments.

This section also includes a method of automatically generating checks to pay your accounts, entering the checks in the check register, and adjusting the balance for the checking account. The actual printing of the check is optional, however, and you may still write out the check by hand if you prefer. Throughout the process, the current checking balance is optionally displayed on the 25th line of the display screen.

As a test of HFS, I had my 12-year-old daughter run the system through a few of its paces—and she had no problem with the system.

This is one of the most desirable sections of the program because it maintains a running accounting of your budget categories. This feature allows tracking your expense categories, and helps you spot runaway expense categories before they get out of hand. In my case, it really helped to see how easy it was to let my "plastic money" get way out of hand—and stop it before it was too late.

The fourth section, *Display*, allows you to display the complete record of your accounts in several formats. For example, you can print out or display on the screen a complete index of all of the accounts used in your finance system, a list of monthly payments by account, and finally a list of account balances to date.

The fifth section, *Asset Accounts*, is where you will enter your savings-account transactions. Like credit accounts, you may have up to 60 different accounts. These can include savings accounts, cash on hand, Individual Retirement Accounts, savings bonds, and certificates of deposit, for instance. It is here that you record transfers from savings to checking or from checking to savings. You are also able to edit entries to prevent incorrect entries. You can enter the interest earned on the account and it is instantly added to the account total. Of course, deposits, withdrawals, and account charges are also entered in this section and calculated into the rest of the system.

In Version Two of HFS, this section also has a new feature which I find very useful. At any time you wish, you can display such things as: your asset accounts itemized by index (a number HFS assigns to the account when opened) with the current totals; the same report without the totals; all asset account transactions in a given month; transactions expenses (withdrawals); all deposits; monthly activity; monthly activity with a summary; or a summary of the month only. The different forms of the report are so useful for accounting uses, I wonder how I got along without them before!

The sixth section, *Balance*, will most likely get the most regular use for keeping tabs on your budget. This is the section used to balance your checkbook. It is fairly straightforward to use (easier than my bank's directions, anyway) and is a useful feature of the system. I enjoyed being able to check the bank's work on my statements. And I felt more confident when I was able to arrive at the same figures the bank did on my account balances.

The next section, *Codes*, is actually a utility to help you set up your code categories. With this section you can build your HFS within a few rather wide limits. This is the section used to edit or delete previously entered code categories. "Codes," sometimes known as budget codes, are personal category numbers you assign to your regular expenses. These are your numbers and yours alone to assign as you wish. They are normally applied toward subjects such as rent, loans, food, utilities, etc. You are allowed a maximum of 30 codes. Each code has a number and a text name. The number itself may be as high as 80, as long as a total of 30 accounts are not exceeded; and the name of the account may be up to 19 characters long.

When you set up HFS, you can decide the names of the accounts you wish to keep, the account numbers, and any other information you wish in the file. A clear record then exists to keep track of those accounts that occasionally claim you haven't paid, or charge you for something you haven't bought.

The eighth section is a utility to help you initialize your new data disk. When necessary, you are prompted for all needed information, including bank names, account numbers, etc. When finished, it automatically writes the data diskette—leaving you with a new data diskette, ready to use. Typically, this would be the section used at the beginning of the new year when you would be opening a new accounting period (year).

The ninth section, *Utility*, is the section to help you with provisions such as adding a second bank to your data, changing the active bank (the one you presently use); and adding more check files to a bank. Finally, there's a section to help you bring over data from one year to another disk for a new year. This is handy when bringing up a new data

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disk for a new year when not all of your checks have returned.

The tenth section is one of the most interesting that I have found in the different finance packages I have looked at. This section will print checks on your printer. Now, I know that not many of us will be printing so many checks we need a machine to generate them for us. But it is certainly nice to sit down at the computer, tell HFS which accounts I want to pay, and how much I want to pay them. My register is automatically updated to the correct current status and I know exactly where I sit financially. I then come to this section which automatically prints out the checks I have specified earlier. This may not seem like much, but normally a feature like this is only available on higher cost business accounting packages, not on home finance programs for home computers.

Also included is a section which provides many different formats for printouts. A few of the possible printouts available include: a list of all deposits for a given month complete with dates and comments on the deposits; a listing of the check register by month; and a summary of financial activity with checks, deposits, and bank charges. The summary is sort of a miniature personal balance sheet, showing the net cash flow for the month. Other summaries available are quarterly summaries by budget category, yearly summary by budget code, and quarterly expenditures by grouped codes. Grouped codes are a selected group of codes chosen by you for analysis.

Under Version Two of HFS, another section is included to help you design a new check which your computer will fill out for you. This section makes it a breeze to design a check to print perfectly on any brand of check you may have bought. The lower portion of the screen is filled with dots, each dot representing a print position on the upper half of the check. (Computer checks normally consist of two parts, an upper half, and a lower half.) Together with your checks, or information provided by the printer of the checks you have ordered, the menu helps you enter where on the check you want the different categories such as date, number, payee, etc. printed. If you prefer not to go through all the design of a custom check, HFS is supplied with a check format already completed for a NEBS check 9020. NEBS is one of the leading suppliers of computer checks and is very cooperative in selling in small quantities to home users.

Making a convert out of me

When I first began to use the Home Finance System, I was very skeptical due to my previous bad experiences with other programs. However, as I use HFS more and more, I have found it to be just what I wanted, and the best I have seen for the Heath/Zenith computers.

The program is very user-friendly, and continually prompts you for what is expected. If another disk is needed for the program, it prompts you for the proper disk, resets the drive, informs you in reverse video which drive to put the disk into, and waits for you to put the disk in. Everything is automatic, and program flow is very smooth.

Disk input/output (I/O) appears to be somewhat excessive. But I believe this is due to the normal Microsoft BASIC disk I/O. There are many files, and many segments of the program to load and unload, contributing to the number of disk accesses required. However, I did not find the amount objectionable. In fact, due to the use of machine-language subroutines, Dr. Gold has greatly improved the speed of the system since he first released his original system. For example, a sort which took about ten seconds on the original release now takes less than two seconds.

Now that HFS allows the use of 80-track drives, the system has become very versatile. It is very easy to put all of the necessary system files on two 80-track disks. With this method, only two disks have to be swapped, instead of the original four. When done this way, the message prompts may sometimes be wrong—asking you to swap disks when it's not necessary, or giving the wrong

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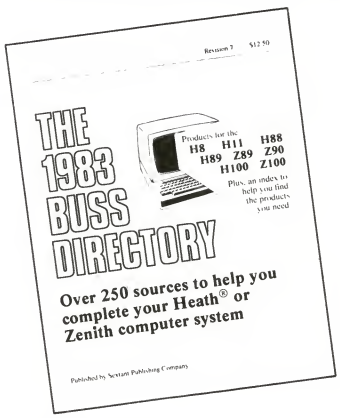

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disk number. But with only two system disks to cope with, that does not present a problem. If you are a programmer, you could possibly get into the BASIC program and change it to reflect the disk numbers you are using.

As a test of HFS, I had my 12-year-old daughter run the system through a few of its paces—and she had no problem with the system, once the HFS disk was initialized and set up. Daily operations were easy for her. She had no previous computer experience other than playing a few rounds of MUNCHKIN.

If I had to list the negative points of the package, it would not be very easy. However, the program does require a full-blown system to operate because of the size of MBASIC. Under HDOS 2.0, 56K of RAM is required for HFS to be functional. However, with the price of memory as low as it is now, this should not present much of a problem for most users.

HFS is not the cheapest finance system on the market. But none of the other packages I looked at, or had experience with, had anything near the features this one has. Dr. Gold has written the instructions in a very easy to understand, non-threatening manner. He did not appear to be talking down to me; and yet he always pointed out the emergency "bailouts" at the appropriate places in the documentation.

One point that should be emphasized is that HFS is a large data base program. As with any data base program, it requires a considerably large amount of information to be typed in to make use of the power of HFS. This, of course, takes some time. I've found that I spend quite a bit of time typing in the information required. I feel this is to be expected when the useful information and different formats of printout data which are available from the program are taken into consideration.

This system borders on being more of a small business accounting system in the power and capabilities it has. I'm glad Dr. Gold felt people deserved the same capabilities in their home accounting systems.

There are several good features to this program that make it easy to use. The printer support is included along with how to use your "different" printer. Dr. Gold doesn't supply device drivers. The program, though, does allow users to specify the escape sequences that their printers use to control things like characters per inch, etc. HFS knows the suitable escape sequences for several printers, but allows users to specify those that it doesn't know. Dr. Gold shows you how to embed special codes to send to your printer that make it do the things you want it to. Do you run your printer on a port other than the "standard" port? You can change your printer port, too.

As I mentioned earlier, the ability to split any given check between categories is very useful to me. I find myself frequently going to a department store and with one check purchasing items which actually belong in several categories. HFS now has provisions for this and gives me a more accurate accounting of my budget.

Friends ask me, if I had to do it over again, would I buy HFS? Without hesitating, I tell them definitely *yes*! I would not hesitate in the least to recommend this system to anyone considering the use of a home finance system on their computer. It has proven very useful to me already on several occasions. My only regret is that it is not available in a CP/M version, since I have recently gone to a Z100 system.

Dr. Jay Gold, the author of the program, has been very helpful and responsive to my suggestions and I would have to rate him an A+ on support for the Home Finance System.

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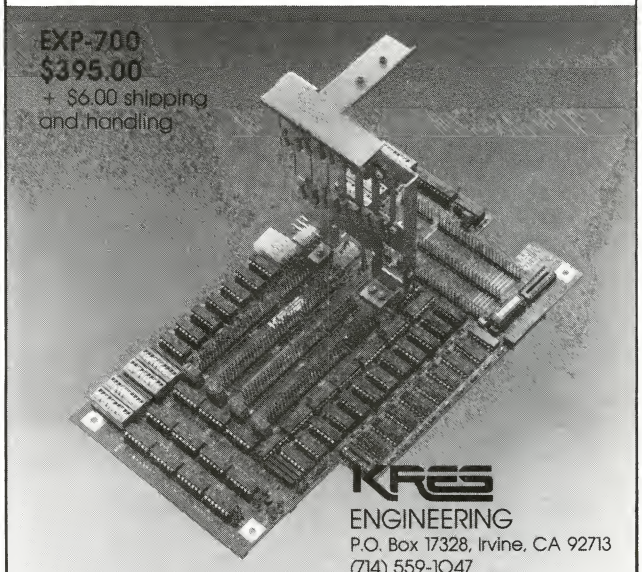

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More Than Just a Pretty Typeface

M.P.I.'s 99G printer is a durable piece of hardware supported by software to provide variety in the printed output.

James Bingham

It all began with a trip down to my local Heathkit Electronic Center to buy a dot-matrix printer for my '89 computer. I had in mind the Epson MX–80, but that's not what I got.

At the time, I had not even heard of the 99G manufactured by Micro Peripherals, Inc. (M.P.I.) of Salt Lake City, Utah. However, it did not take much of a demonstration at the Heathkit store to convince me that the M.P.I. 99G is an excellent printer. Admittedly, it cost a few dollars more than the MX–80, but I purchased it anyway.

The store was all sold out at the time, so I had to wait four days for the new shipment to arrive. I ordered the printer on a Monday and got it Friday afternoon, much sooner than I expected. In fact, I couldn't use it at the time because I was waiting for a serial RS–232 cable which I had ordered from Wisconsin Intelligent Systems Engineering (W.I.S.E.). About all I accomplished with the printer that first weekend was unpacking and checking it out. I looked over the manual and ran the self-test checks. Everything appeared to be intact and operational.

About the middle of the following week, I received the cable from W.I.S.E. and proceeded to tie it all together. This is the point at which my troubles started and, for the next few days, I just wasn't too happy with the new addition to my system. It seemed as if the receipt of this cable ushered in Murphy's famous law; i.e., whatever can go wrong, will. Because it sure did. Ironically, it also pointed out one of the M.P.I.'s real virtues.

Untangling my cables

Ron, the manager at Heathkit, told me that the printer was all ready to go. All I had to do was to connect it to my serial card and enjoy some hardcopy. Of course, he was assuming that I would be using Heath's serial card and the Heath RS–232 cable.

In reality, I was using W.I.S.E.'s serial/parallel/clock board, the 2S+2P+RTC, and the W.I.S.E. cable.

The 2S+2P+RTC board was purchased several weeks prior to the acquisition of the printer. (I chose this board because of the versatility inherent in having serial ports, parallel ports, and a real-time clock all on the same board. After receiving and inspecting the board, I found its operation and documentation to be excellent. It is a very high quality product and one which I feel complements my system.)

So why the problems? The serial ports on the 2S+2P+RTC card are advertised as both hardware- and software-compatible with Heath's board. I couldn't understand why I was getting nothing but garbage out of the printer.

After running the self-test checks on the printer again, I dropped to the lowest baud rate and started up. I could print just fine up to 300 baud, but past that—garbage. Further perusal of the printer manual revealed the fact that up to 300 baud, the printer will keep up with the computer. But at faster rates, it becomes dependent upon correct handshaking to maintain print integrity.

A few hours later, I finally figured out that two of the handshaking signals between the computer and the printer were reversed. The easiest place to correct this problem was in the W.I.S.E. cable. The two wires which I reversed were on pins 7 and 14. (These lines are labelled DSR and CTS on the W.I.S.E. wiring diagrams.) After correct handshaking was realized, I got fantastic printout at 1200 baud. However, my elation was very short-lived, since about 20 minutes later—nothing.

My first thought after the printer went dead was the possibility of a bad connection. A thorough inspection of the interconnect and power cables failed to turn up any problems. This forced me to face the fact that my trouble was with either the computer or the printer. Another run of the printer self-test checks served to reveal a dead printer.

What next? Ship it back to M.P.I. in Salt Lake for maintenance? (For how long?) Or attempt repairs myself and void the warranty? I have about 20 years of electronics experience of which the last several have been associated with computers. I had no qualms about my technical ability to repair the printer. The only question concerned the cost of replacing defective parts versus my willingness to be without the printer for another several weeks while warranty work was being performed.

I didn't have to consider losing my warranty and paying later repair costs in the long term, since the warranty is only valid for 90 days from date of purchase. After careful consideration of the options, I decided to perform a more complete check to see if the problem could be quickly isolated to either the printer mechanism or the electronics.

Any time a piece of equipment is totally dead, an excellent place to start is with the power source and go from

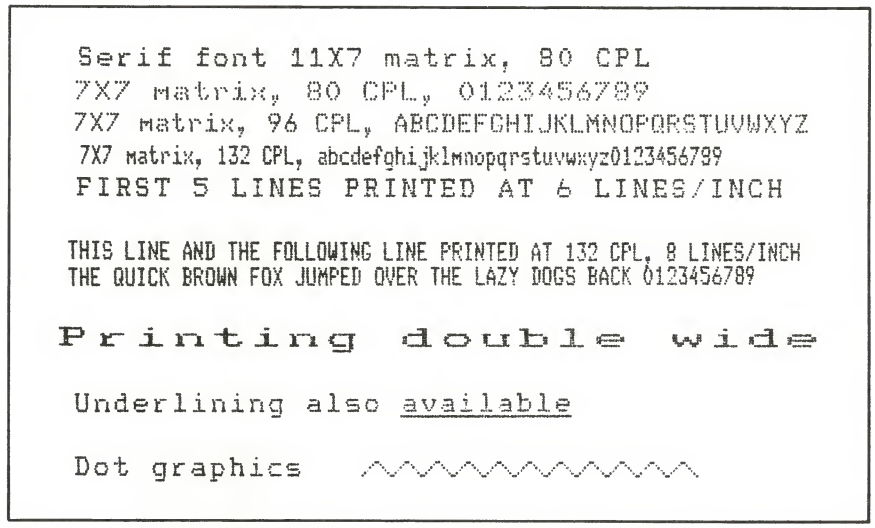
Serif font 11X7 matrix, 80 CPL
7X7 matrix, 80 CPL, 0123456789
7X7 matrix, 96 CPL, ABCDEFGHIJKLMNOPQRSTUVWXYZ
7X7 matrix, 132 CPL, abcdefghijklmnopqrstuvwxyz0123456799
FIRST 5 LINES PRINTED AT 6 LINES/INCH
THIS LINE AND THE FOLLOWING LINE PRINTED AT 132 CPL, 8 LINES/INCH
THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS BACK 0123456789
Printing double wide
Underlining also available
Dot graphics

Figure 1. Sample of standard fonts produced by the MPI-99G printer.

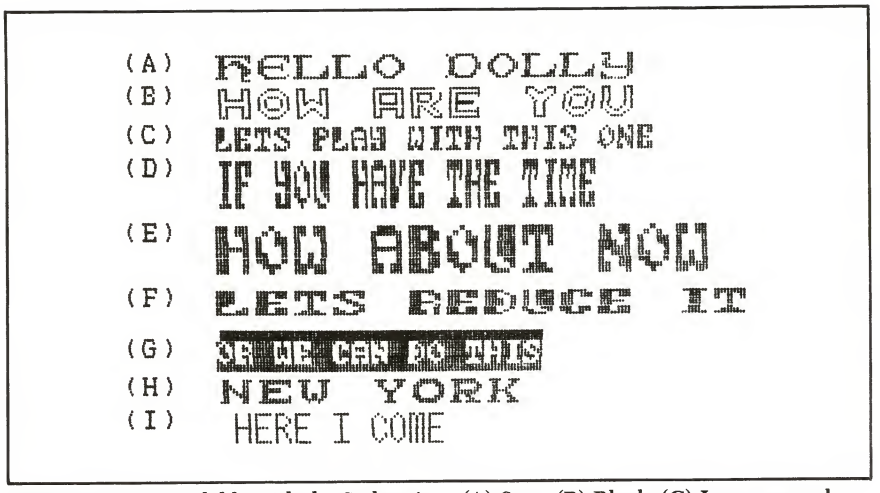
(A) HELLO DOLLY
(B) HOW ARE YOU
(C) LETS PLAY WITH THIS ONE
(D) IF YOU HAVE THE TIME
(E) HOW ABOUT NOW
(F) LETS REDUCE IT
(G) SEE WHAT CAN BE DONE WITH THIS
(H) NEW YORK
(I) HERE I COME

Figure 2. Fonts available with the Stylewriter: (A) Spar, (B) Block, (C) Jazz—normal, (D) Jazz—double high, (E) Jazz—double high and double wide, (F) Jazz—double wide, (G) Jazz—inverted, (H) Dallas, and (I) Orator.

there. A few checks here turned up the fact that I had 7.5 volts on the integrated-circuit (IC) chips where there should have been only 5 volts. This excess voltage was traced to a defective LM7805 regulator which I then replaced. This corrected the high-voltage problem but the printer was still dead.

This prompted the speculation that the high voltage had probably destroyed one or more of the IC chips. If a chip is shorted, it is very easy to locate since it will be running hot, due to excessive current flow. An open or malfunctioning chip requires much more elaborate troubleshooting techniques. A physical inspection of each chip turned up one blister on my pinky due to a red-hot 74LS74.

Following replacement of this chip, I again applied power to the printer. I was still a little apprehensive but the self-check tests showed the printer to be operational, or apparently so. I say "apparently" because the self-test checks do not test all the special-function escape sequences which are in read only memory (ROM).

This led to a more complete check-out from the computer to see if I had total control of the printer from the keyboard. This check showed everything "*go*," so I was back in business for less than two dollars in repair costs.

What did my problems prove?

One thing that really impressed me during all this was the ease with which the printer can be disassembled and reassembled. Disassembly requires only the removal of four screws, three plugs, and three individual wires. The three individual wires are also on plugs and go to the power transformer. After this, the printer may be laid out on the work area as three separate units: the printer mechanism, the printed-circuit (PC) board with the electronics, and the case plus power transformer. Reassembly is just as easy.

As for the printer's initial malfunction, I do not believe this reflects adversely on the quality of the merchandise. I talked to Ron, down at Heathkit, and he said that he had not heard of anyone else having any problems with their M.P.I. printers. At that time, he had been selling the printers for several months so he had received some feedback. The feedback he received was very favorable to M.P.I.

What did I get?

I have had the printer operational for a few weeks now, so I've had some time to play with it and I'm quite impressed. If you purchase the printer from Heath, it will probably have a sound cover and an Ap-Pak included. If you purchase it elsewhere, you may have to purchase these items separately. The major benefit of the sound cover seems to be in keeping dust out of the printer mechanism. The Ap-Pak (trademark of M.P.I.) contains the serial RS–232 cable and some excellent software which runs under the CP/M operating system. (M.P.I. doesn't provide support for the Heath Disk Operating System [HDOS], but I believe that Lindley Systems in Massachusetts may be able to help you in that department.)

The printer has 14 internal switches which determine the mode in which it is powered up. The various modes of operation are also software-selectable so that they may be changed on the run. I have found that the ideal modes, for power-on, are as follows: form length at zero inches; automatic perforation skip to OFF, line spacing to six lines per inch; auto line-feed select to OFF; and the high quality 11 x 7 Serif font (80 characters per line). Many of the modes of operation programmed into the printer's read only memory (ROM) are illustrated in Figure 1.

The options for underlining and printing double-width characters are available for all print densities even though I only show them once in Figure 1. The printer also has a self-test check which may be initiated at the front panel. This self-test prints out the printable ASCII characters only. The non-printing characters for underlining, dot graphics, and double-width are initiated by escape sequences sent by the computer.

Room for improvements?

There are only two facets of the printer which I feel could be improved. To begin with, I prefer to see the numeral zero with a slash through it. I have been known to strike the letter "O" instead of the numeral zero when entering programs. Errors of this type would be easier to spot, when proofreading, if the numeral zero had a slash through it. The M.P.I. 99G prints the numeral zero without a slash. (This may be seen in Figure 1.)

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the power on and select lights. These are recessed light-emitting diodes (LEDs) and unless a person is in line with the printer and on the same level, they are quite hard to see. As a result of this, I have left the printer powered up occasionally. I feel that these indicators would be more functional if they were slightly extended.

Of course, the numeral zero and the LEDs are strictly a matter of personal preference, and I suppose that I will eventually get used to them.

Software

So much for the printer itself, pros and cons. Let's move on to the software supplied with the Ap-Pak. This software consists of the Stylewriter program, the Calligrapher program, and about 20 auxiliary programs for use with the Stylewriter. The Stylewriter program utilizes the dot-addressable feature of the printer to generate many different type fonts.

A few examples of different print styles generated on the M.P.I. 99G printer using the Stylewriter are shown in Figure 2. Also supplied with the Stylewriter are fonts of Egyptian, Greek, and Hebrew letters. Superscripts, subscripts, and special math symbols are also available. Should you desire a symbol or font not supplied, the Calligrapher program allows you to design your own. These programs are extremely easy to use. I generated the font designated "Block" in Figure 2 in less than two hours; and I'd never used a dot-addressable printer nor a program like Stylewriter before. (The font that I generated consists of all the letters and all the numbers even though only a few are shown here.)

The directions for installing the Stylewriter on the H/Z89 are very easy to follow. If you're just getting into CP/M, these instructions also contain very clear directions for generating a working system disk from the CP/M master disk(s).

To wrap it up

To wrap it up, I would have to say that the two aspects of the M.P.I. 99G printer which impressed me the most are the way in which it is assembled and the ease with which the graphics may be used. The ease of assembly should greatly expedite any maintenance which may be required. For the time-conscious person, this translates into minimum lost time in the long run. The software supplied with the Ap-Pak makes operations involving the graphics very easy to perform. Even though I had a little trouble at first, I am very happy with this printer and would recommend it to others.

Ordering Information

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The 99G at *Sextant*

We've been using the M.P.I. 99G here at *Sextant* for about a year. In this time, it has served us well, printing address labels for *Buss* issues and for *Buss* and *Sextant* renewal notices, and printing invoices for *Sextant* subscribers and retail dealers. We also use the 99G to print subscriber lists and almost everything else that comes out of dBASE II, which we run on our Z89 with 10-megabyte Z67 hard disk. (One marathon printing session lasted 12 hours, resulting in a combined printout of the names and addresses of *Buss* and *Sextant* subscribers, in ZIP-code order. In this time the printer did not melt, explode, or otherwise react in a manner one might expect from a 15-pound machine under such stress.)

The other printer we've been using this year is an H25. The advantages of the M.P.I. printer over the H25, we found, were mostly related to the use of dBASE II. The 99G's print buffer is eight times that of the H25. When we're printing labels indexed either alphabetically or by ZIP code, the '89 has to search for each record, which means that with a data base the size of *Sextant*'s subscription file, the computer will throw a whole label at the printer and then pause. With the M.P.I.'s buffer of 2,000 characters, the printer can accept one entire label into its buffer and let the '89 immediately begin searching for the next one. When we use the H25, with its smaller buffer, the printer and the computer take turns waiting for each other. As a result, although the 99G theoretically prints more slowly than the H25 (100 characters a second versus 150), this gap narrows when the printer is used with a complicated program like the ones we use to print labels under dBASE II.

Another advantage of the 99G is that, as noted in the article, it can handle a form length of 0 inches, while on the H25 the smallest form length is two inches. Again, this is a definite plus in printing labels, because most labels are shorter than two inches. The only way to get around this, on the '25, is to write the program as if eight labels, on a four-across sheet, constitute one form; you then put in a form feed after the second row of labels. On the M.P.I., on the other hand, form length can be designated as 0 inches with a form feed after each row of labels. The program for this is half as long as it would be with a 2" minimum form length. (dBASE II insists on issuing a form feed when RESETting its line counter to zero.)

The M.P.I.'s double-width printing can be enabled with a single in-line command. This is how we are able to print renewal notices with just the ZIP code double-width, and the rest of the label regular width. The M.P.I. also has the capability to change the number of characters per inch, although it can only do this at the left margin.

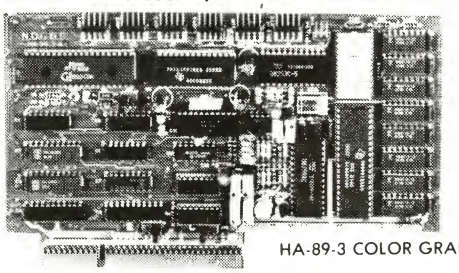
We have found, contrary to Jim Bingham's impressions, that the sound cover does make a significant difference in muting sound. It cuts off the high frequencies more than the low frequencies but, believe me, on a 12-hour printing spree with three people in the computer room, this is a real necessity. (Although the sound of the M.P.I. can never match the H25 in setting-nerves-on-edge capability.)

A couple of minor drawbacks: the 99G can't be configured for more than 132 characters per line. The H25 can print as many as 222 characters per line (and M.P.I. sells a wider machine, the 150G), but we have found the 99G to be adequate for our needs. The other drawback *has* been a problem for us, though. We use the 99G tractor feed. It has tractors only above the ribbon (the H25 has them above and below), and there is not always enough tension on the labels to keep the top line of print aligned with the top of the label. Even if this varied only 1/1,000 inch per label, after 5,000 *Buss* labels the printer would be off by five inches. We have taken care of this by stacking the unused labels on the floor, and we keep the printer on a table—the weight of the labels hanging from the printer to the floor slows the forms input to the right speed.

All in all, the M.P.I. 99G has been very well suited to our needs at *Sextant*.

H-8 and H/Z-89 ACCESSORIES

PUT COLOR GRAPHICS ON YOUR HEATH/ZENITH COMPUTER



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HA-89-3 COLOR GRAPHICS BOARD.....**$299.00**

This board will expand your H/Z-89 computer to include color graphics and sound effects with support for both HDOS and CP/M. High level application support under GRAPH-PAC-II (see description below), and all for a price much lower than other boards offering much less! Uses the advanced TMS-9918A Color Video Generator which displays brilliant color graphic output on any video device accepting NTSC signals. Included is a documentation package which contains a distribution disk with sample programs and driver routines, a 275-page manual with detailed information on installing and using the HA-89-3, a schematic, manufacturers' data sheets for the major components of the board, and a list of vendors who have commercial software packages available for this board. The standard board includes:

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- **Joysticks (each)** ..... **$ 14.00**

Add $15.00 extra if options are not purchased with basic board.)

Please specify operating system (HDOS or CP/M) and disk format (any standard Heath format).

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A software support package for the HA-89-3 and HA-8-3 Color Graphics Boards described above.

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  PASCAL/MT+
  FORTRAN-80
  COBOL-80
  C/80 Ver. 2.0 (requires M80 and L80)

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- Includes variant records, sets, record files and procedure passing
- Modular compilation with external variables
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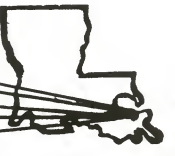

Ordering Information: Products listed are available from NOGDS, 7230 Chadbourne Drive, New Orleans, La. 70126. Check, Money Order, VISA or MasterCard accepted. Phone orders call (504)241-9495. Add $5.00 shipping (VIA UPS unless otherwise specified).

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Games Roundup

To every taste, there is a game.

Frederick Zimmerman

Whatever your interests, there's probably a computer game for you. For example, maybe you like puzzles and intellectual challenges. If you like them with a flavor of fantasy, you'll probably enjoy playing an Adventure-style computer game. If you like your intellectual challenges more abstract, your computer can play chess.

On the other hand, though, perhaps you simply want to dispel tension by blasting away at menacing alien lifeforms, while developing and testing your hand-eye coordination. In that case, you'll probably enjoy an arcade-style game.

If you'd like to do something which will challenge your intellect *and* your hand-eye coordination, you might like a flight simulator program. If you're in a mood for an entertaining story, you could try your hand at interactive fiction. If you'd like to get your children interested in a constructive use of your computer, there are a number of educational word games. In short: there are a lot of different computer games out there.

According to the Reader Profile Survey conducted for *Sextant* by McGraw-Hill Research in February 1983, 56.9% of you use games and entertainment software. That makes games the second most popular type of software. Only word processors and text editors are more commonly used (79.1%). So we thought it might be useful to give you a reference tool which you can use whenever you are shopping for Heath/Zenith entertainment software. In the following survey, *Sextant* has described and evaluated almost 50 games available for Heath/Zenith computers.

To gather the information, *Sextant* wrote to every supplier listed under "Games" in the index of *The 1983 Buss Directory*. We also put a notice in issue #71 of *Buss: The Independent Newsletter of Heath Co. Computers*. Nearly everyone responded promptly, and I'd like to thank the suppliers for their help.

Software Description Format

Information about each program is presented in a standard format.

Program Name
Price
Supplier: See Ordering Information, below, for the full address.
Disk format: Are hard- or soft-sectored distribution disks available? How about 8" CP/M?
Hardware required: On which Heath/Zenith computers will this program run? What is the minimum necessary random-access memory (RAM)? Are any other hardware devices required?
Operating System; Programming Languages: Under which disk operating systems does this program run? Are any programming languages needed?
Audience: For whom is this program intended?
Playing Time: My estimate of the time in which a beginning player would typically complete one game.
Description: The supplier's description of the game.
Comments: Any remarks I have to offer.

Evaluation criteria

I ran each program, verified that it operated as described, and played the game for an hour or so. I've concocted a numeric scoring system which will, I hope, convey to you my impressions of each game's performance. These ratings are presented in a box to the right of each listing. I should emphasize at the outset that there is a definite element of subjectivity here, although I did try to base the ratings on consistent criteria. Throughout, **1** is the minimum rating, **5** the maximum.
Graphics: How good do the graphics look? I assigned ratings of **1** to games which used text only; **2** to games which used text only, but in a manner which was easy on the eyes; **3** to games which made use of the standard H/Z19 graphics character set; and ratings of **4** and **5** to games which used color or made unusually interesting use of the graphics set.
Adjustability: To what extent can the player configure the game to suit particular needs or inclinations? **1** means the player has virtually no choice but to play the game as presented. (Note that this is a design objective of certain types of games, such as Adventures.) **5** means the player can easily change most of the significant parameters of the game.
Cleverness: How clever was the design of this game? How sophisticated do the programming techniques seem? How original are the ideas behind the scenario?
Complexity: How difficult is it to learn the rules of this game? **1** means very easy; **5** means very hard.
Reasonableness: To what extent are the rules internally consistent and sensible? Games rated **1** are verging on silliness; games rated **5** seem unusually logical and well thought-out.
Intelligence: **1** means that even a dim bulb like the TV cartoon character Bullwinkle could do well at this game. **5** means that winning will require some deep thinking.
Hand-eye: Even adults can win at games rated **1**. Games rated **5** call for exceptionally good hand-eye coordination.
Winnability: **1** means it's going to take a minor miracle for you to win. **5** means that you can hardly avoid it.
Heuristics: To what extent can this game encourage the player to learn? A rough assessment of a game's educational value.

Adventure-style games

In an Adventure-style game, the player "moves around" in a fictitious environment by giving the computer one- or two-word commands, such as "GO EAST" or "UP". When you LOOK to see where you are, the computer reports on your location. For example, "You are at the southern end of a long north-south corridor. There is a stone door at the far end of the corridor."

If you'd like to go to the door, you'd say "GO NORTH" or "WALK DOOR." The computer will usually respond by saying something like "You are at the stone door." If you want to learn more about the door, you might say "LOOK DOOR." Sometimes the program will give you more information—"There is a knife embedded in the door"—and sometimes it will give you a more frustrating response—"You are at the stone door."

Of course, you aren't limited to WALKing and LOOKing. In most Adventures you could try to TAKE the KNIFE, or OPEN the DOOR. But it's not always so obvious which commands to use; nor can you be certain you have discovered all the possible command phrases. (Did you think of LISTENing at the door?) In fact, part of the challenge of an Adventure game is discovering, by trial-and-error, which English verbs are effective commands. Some of the most complicated games have vocabularies of up to 600 words (including verbs, objects, and locations). However, it is quite possible to play an enjoyable game with only ten or fifteen command verbs, because the essential joy of the game comes in solving a series of puzzles.

Sooner or later in every game (and usually sooner), the player will run up against a seemingly unclimbable wall, or

a locked door with no key to be found, or an invincible basilisk which turns everything it sees to stone, and progress will cease—until the player solves the problem. Perhaps the player will deduce that there might be a secret passage through the wall; or examine a seemingly empty room, and find a key; or realize that it's possible to neutralize a basilisk with something as "low-tech" as a pocket mirror attached to a broom handle. These puzzles are often extraordinarily ingenious, and frequently the player must take it on faith that a solution is possible. It is no exaggeration to say that even a very clever person might need days or weeks or months to finish a well designed Adventure.

The Original Adventure
$19.95
The Software Toolworks
hard- or soft-sectored;
8" CP/M
H8, H/Z89, H/Z100
HDOS, CP/M, or Z–DOS
adult
days, weeks, or months

Graphics	2
Adjustability	1
Cleverness	5
Complexity	5
Reasonableness	3
Intelligence	5
Hand-eye	1
Winnability	2
Heuristics	3

Description: "Brave the dangers and meet the challenges as you explore the magic realm of Colossal Cave. You are the adventurer seeking fabulous treasures, mythical adversaries to overcome, and initiation into the secret spells which operate within the cave. The fantasy world is brought to surprising reality by your personal computer as it vividly and amusingly serves as your guide and advisor, describing the sights and sounds about you. The original Adventure has inspired hundreds of computer game creations. Now experience for yourself all the wonders of the original, plus new rooms and treasures, and an improved, expanded ending, in the only version of Adventure endorsed for authenticity by the game's creators, Will Crowther and Don Woods. Solving all the puzzles of the cave entitles you to receive a free serial-numbered Certificate of Wizardness, officially endorsed by Crowther and Woods and suitable for framing."
Comments: "The game of Adventure was developed around 1975 by Will Crowther, a researcher at Bolt Beranek and Newman (BBN), the Cambridge, Massachusetts, research firm which built such projects as ARPAnet and the TENEX operating system. Will used to drive down to Kentucky periodically to join other amateur spelunkers in exploring Bedquilt Cave, a huge cavern connected to Mammoth Cave. Topographic data was stored in BBN's computers and used to produce maps of the cave. Thus, it's not surprising that Adventure's Colossal Cave, at least up to a point, is really Bedquilt Cave, and the description and geology of the first few levels is consistent and accurate."

"Adventure became a complete game thanks to Don Woods of Stanford, who added most of the features of the present version. Written in FORTRAN, the game spread onto PDP–10 and DEC 20 computers over the ARPAnet, one of the first computer networks, which connected university computer science departments and other research institutions all over the country. Soon it was eating up uncounted hours of both computer and student time, leading to its outright banning on some machines, and the restriction of play to nights and weekends on others."

"As personal computers became more popular, it was inevitable that Adventure would migrate to them. Its success gave rise to a whole number of adventure-type programs, taking adventurers on pirate-infested seas, through outer space, into haunted houses, and so on."

"This program is the first of them all—the original Adventure.... one of the most famous entertainment programs in existence."

Adventure Maker
$21
Studio Computers, Inc.
hard-sectored
H8/19, H/Z89
HDOS 2.0 or
CP/M; MBASIC
adult
about two hours

Graphics	2
Adjustability	4
Cleverness	5
Complexity	4
Reasonableness	4
Intelligence	5
Hand-eye	1
Winnability	3
Heuristics	4

Description: "Create your own Adventure-type games to your specifications... Adventure Maker allows you to design short or long games with varying levels of difficulty. Typical Adventure-type commands are recognized, such as 'pick up bottle,' 'use gun,' 'drop torch,' as well as six movement commands: North, South, East, West, up, and down."

Adventure Maker allows you to define 15 to 60 different locations through which the player may travel, a number of different "objects" which the player may obtain, and several different problems and/or threats which the player must overcome.

(If you are familiar with fantasy role-playing games such as "Dungeons and Dragons," you will recognize that Adventure Maker is a program which allows you to take on the role of the DungeonMaster or referee—the person who creates the adventure scenario.)

Adventure Maker consists of two separate programs; one to create the scenarios, and a run-time module to play the Adventures you have created.
Comments: I do have one beef with the software engineering. In order to run the game, you must INITialize and SYSGEN a disk, then delete the non-essential system files (such as ONECOPY.ABS, SYSHELP.DOC, etc.). You must make sure that you haven't loaded any device drivers, or else you won't have enough memory to run the game. Finally, when you run the program in MBASIC, you must use a switch (MBASIC/F:1) which limits the number of files you can use. None of these requirements is unbearable, but cumulatively they are somewhat annoying. Ideally, the user should be able to run a well engineered piece of software as soon as it's been copied off the distribution disk.

To be fair, I should add that the documentation is very helpful. The author has taken the trouble to anticipate which problems you are most likely to encounter. He then explains what causes the problem and how to solve it.

The great advantage of Adventure Maker is that Its Potential Applications Are Limited Only By Your Imagination. Yes, it's a cliche, but in this case it's true, since you can create an adventure scenario to take place in any environment you desire. For example, when I was testing this program, I created a mini-Adventure set in the *Sextant* offices. The key locations were the kitchen, the computer room, the production room, and the 7–Eleven downstairs; the key objects were floppy disks and Slurpees.

I gave Adventure Maker a high heuristics score because it seems to me that there might be some interesting educational applications, e.g.:
You are in the femur.
LOOK
The thigh-bone is connected to the kneecap.
GO DOWN.
You are in the patella.
...

Caverns of the Doomed
$22.95
Studio Computers, Inc.
hard-sectored
H8/19; 48K. (Talking version: 56K, Votrax "Type N Talk" text-to-speech synthesizer, Votrax device driver.)
HDOS 1.6 or 2.0 (talking version: HDOS 2.0);
MBASIC version 4.7 or 4.82 (talking version: MBASIC 4.82).
adult
about one-half hour

Graphics	4
Adjustability	3
Cleverness	4
Complexity	4
Reasonableness	3
Intelligence	3
Hand-eye	4
Winnability	3
Heuristics	1

Description: The program's author, Haywood Nichols, Jr.: "After being an avid Adventure game player for several years, I'd come up with my own wish list of what I wanted to see in an Adventure game: real-time action, graphics, animation, some random factors thrown into the game to make each journey a little different but still leave you familiar with your surroundings after many explorations. Caverns of the Doomed is the end result. Even after 'play testing' for many long hours, I still find the game challenging."

Caverns of the Doomed is an interesting compromise between arcade-style action graphics and text-oriented adventure games. The screen

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Circle #145 on Reader Service Card

displays a room, which may contain treasure and/or monsters, and you can use any of 14 commands to move around the room, attack or defend against the monster, search for the treasure, or heal your wounds. There are 30 rooms.

Comments: On the whole, I think Haywood Nichols deserves considerable credit for combining graphics- and text-oriented entertainment; this is an excellent approach to fantasy adventure.

The Chasm

Graphics	2
Adjustability	3
Cleverness	3
Complexity	3
Reasonableness	1
Intelligence	2
Hand-eye	2
Winnability	3
Heuristics	1

FGL Enterprises
hard-sectored
H8/19, H/Z89
HDOS; MBASIC
general
about one-half hour

Description: "Chasm is a game in the Adventure flavor." The player may choose from a variety of tactics to fight fantastic creatures.

Comments: I gave Chasm a low rating on "reasonableness" because the plot of the game seems to consist entirely of a series of "hack-and-slash" battles.

Paul Hoerner of FGL Enterprises' Heath Division told us that "this company is made up of a group of boys, ages around 15, who enjoy programming and playing games. Since it is the summer time, our company is in full swing ..."

Disarm

Graphics	4
Adjustability	1
Cleverness	5
Complexity	5
Reasonableness	3
Intelligence	5
Hand-eye	1
Winnability	1
Heuristics	4

$34.95
Friendliware
hard-sectored
H8/19, H/Z89; 64K RAM.
CP/M
adult
days, weeks, or months

Description: "You are in a room with one large, very sophisticated bomb. The bomb has been placed on an even larger steel table which is electrically grounded. You seem to be relatively safe, as you sit behind a massive six-ton lead shield. Behind you is one of the room's concrete walls and a door, marked EXIT ... probably the key word for quitting."

"Someone has spent much effort contriving this bomb. Someone else promises you pride and one million dollars for disarming it. For added safety, you have a computer's remote video scanner and associated robotics, so that you may SCAN, ANALYZE, and manipulate the bomb from behind the lead shield."

Comments: The low winnability score is based on Friendliware's comment that "DISARM is not a word-guessing game. It is not a game at all. If you believe you have the first solution before 1 May 1984, call Friendliware immediately." The high score on graphics was prompted by the way DISARM simulates video scanner views of the bomb from all sides. Since the puzzle to be solved is rather technical in nature, I would especially recommend DISARM to readers who enjoy tinkering with engineering problems; but anyone who likes Adventure games will probably find this game enthralling.

A Galactic Experience

Graphics	2
Adjustability	1
Cleverness	4
Complexity	4
Reasonableness	4
Intelligence	4
Hand-eye	1
Winnability	3
Heuristics	1

$25
Hoyle & Hoyle Software
hard- or soft-sectored
H8, H/Z89, H/Z100
CP/M
adult
days, weeks, or months

Description: "You are in the communications center of Earth's spaceport. The room is circular in shape and doors leave the room like spokes on a wheel.

The lieutenant on duty says, 'Captain, your departure is all set for 0800 hours tomorrow morning. Have you decided on your course vectors?'

A clock on the wall reads 1620 hours.

?GO EAST

You are in a foyer leading to the wing of private quarters. This room contains lots of comfortable sofas and chairs.

A sign above the entrance reads: through these portals pass the elite of the space adventurers. Feel free to connect up to the computer using the entrance code PUBLIC and the password SECRET.

A clock on the wall reads 1640 hours.

There is a computer CRT terminal here.

?LOGON COMPUTER

User Name: PUBLIC

Password: SECRET

Welcome to the universal information retrieval service.

Please remember that all captains should check in with the base commander three hours before liftoff.

Information available on:

1) Planet locations
2) Ship personnel seeking employment
3) General gossip."

Comments: There is a time element in Galactic Experience. For example, in order to start off on the journey, the player must assemble a crew for the spaceship before the scheduled liftoff time. Since most of the early puzzles are fairly straightforward, this makes the game more challenging.

A Physical Experience

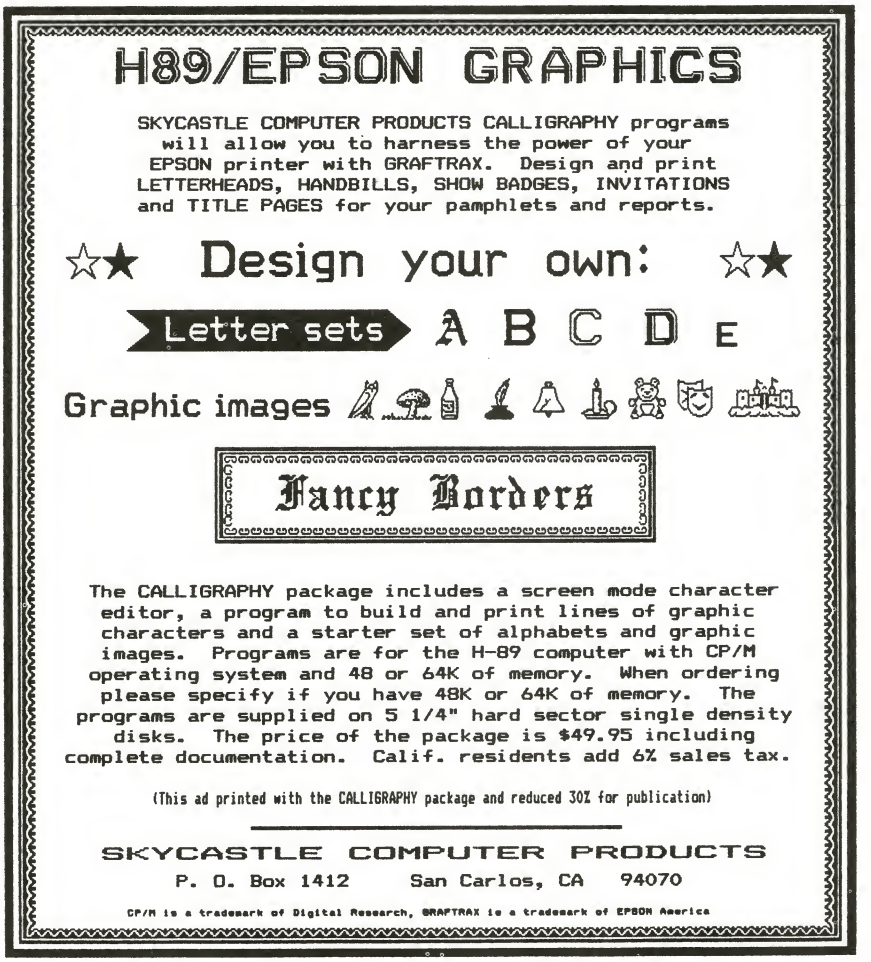
Graphics	2
Adjustability	1
Cleverness	4
Complexity	4
Reasonableness	4
Intelligence	4
Hand-eye	1
Winnability	2
Heuristics	3

$19.95
Hoyle & Hoyle Software
hard- or soft-sectored
H8, H/Z89, H/Z100
CP/M
adult
days, weeks, or months

Description: "You are in a circular hallway before a closed door.

?KNOCK

There is no answer.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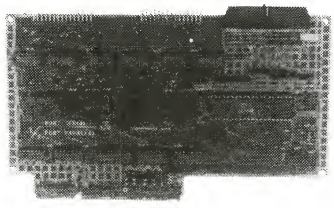

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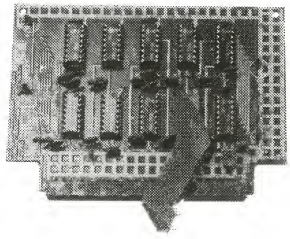

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?KNOCK

You are in the room of Laura Fields—crack pilot. Miss Fields will accept employment for 10% of the profits. She has an excellent record and has flown eight successful deep space missions. On her last mission, she was decorated for unusual bravery above and beyond the call of duty.

?HIRE LAURA

Miss Fields has been hired and will report to the ship by 7 AM tomorrow morning...."

Comments: "Physics is the theme of the game," Olivia Newton-John to the contrary notwithstanding.

Public Domain Software
$8
Furman Smith
hard-sectored
H8/19, H/Z89
HDOS; MBASIC
children
around one hour

Graphics	3
Adjustability	3
Cleverness	4
Complexity	2
Reasonableness	4
Intelligence	3
Hand-eye	1
Winnability	5
Heuristics	5

Description: "NELLAN.BAS and CAKE.BAS are simple non-violent computerized fantasy simulations for kids, published in the July 1980 and July 1981 issues of *Recreational Computing*." FIBNIM.BAS plays a version of the strategy game "nim."

Comments: What a pleasure to play a non-genocidal game! NELLAN.BAS and CAKE.BAS are strongly recommended for children (and especially, I would say, for ages under 10). NELLAN is written so that several people can play together—and, even better, the computer tells the players when it's time to give someone else a turn. The players' objective is to earn points by DEPOSITing or DROPping treasures in the Bank Room. "The creatures are all friendly; thus, planning, problem-solving, and inventiveness are encouraged in a non-threatening atmosphere." Since NELLAN and CAKE are listable BASIC programs, you can customize the games to suit your particular audience.

FIBNIM is fun, but there *is* a winning strategy, so it will eventually exhaust its appeal.

NELLAN and CAKE were written by Furman Smith, a professor at the University of Houston at Victoria. FIBNIM was written by Mary Ann Gohlke, one of Smith's students. NELLAN is also available from the Heath Users' Group Library (885 - 1088 MBASIC games disk, $20).

A Remarkable Experience
$16
Hoyle & Hoyle Software
hard- or soft-sectored
H8, H/Z89, H/Z100
CP/M
adult
days, weeks, or months

Graphics	2
Adjustability	1
Cleverness	4
Complexity	4
Reasonableness	4
Intelligence	4
Hand-eye	1
Winnability	2
Heuristics	3

Description: "You are standing on a small grassy knoll in the midst of a dense forest. Two obvious paths lead East and North. A rushing stream can be heard in the distance.

?NORTH

You are standing at the base of a wide oak tree. A path leading West and a stream leading South begin here. The low branches make this tree appear inviting to climb.

?CLIMB TREE

Effortlessly, you ascend the oak tree and pause, standing on the first big branch.

To the East, in the distance, a small hut can be seen.

?CLIMB TREE

Which way?

?CLIMB UP

You are sitting in a natural 'V' formed by two branches in the top of the wide oak tree. To the East, the small hut can be seen, easily.

Burned into a nearby branch is a clue:..."

Comments: This game has a similar flavor to the original Adventure.

Arcade-style games

The most significant differences between arcade-style game programs written for microcomputers and the games you see in the arcades are that the dedicated game machines generally run a bit faster, have somewhat superior graphics, and use more sophisticated control devices (such as joysticks). As far as the player is concerned, however, the main activities are unchanged: moving and shooting.

Blast
$19.95
Ralph W. Boyd
hard-sectored; other formats may be available on special request.
H8/19, H/Z89; 64K RAM; joystick; a 9918A Graphics II high-resolution chip for the HA–8–3 and HA–89–3 color boards from New Orleans General Data Services.
HDOS or CP/M
general

Not evaluated — we lacked appropriate hardware.

Description: "Blast is a color video arcade game. You are in command of a flying saucer and your mission is to destroy the cities of an alien planet. You use your joystick to position your saucer over each city to fire your laser. With each hit the city will be destroyed by an atomic blast with sound effects. The cities will defend themselves by firing photon torpedoes at you—one hit and you will be blown to bits. In addition, each city has a second weapon, which must be charged up to be fired. If you take too long to destroy the three cities on each screen, the remaining ones will blast you with their maser. You have only three saucers per game, and you will receive 10 points per city that you destroy."

Comments: "Please specify which Heath

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Detoken requires Z100 monitor ROM version 1.2 or greater for operation and will not detokenize protected BASICA files.

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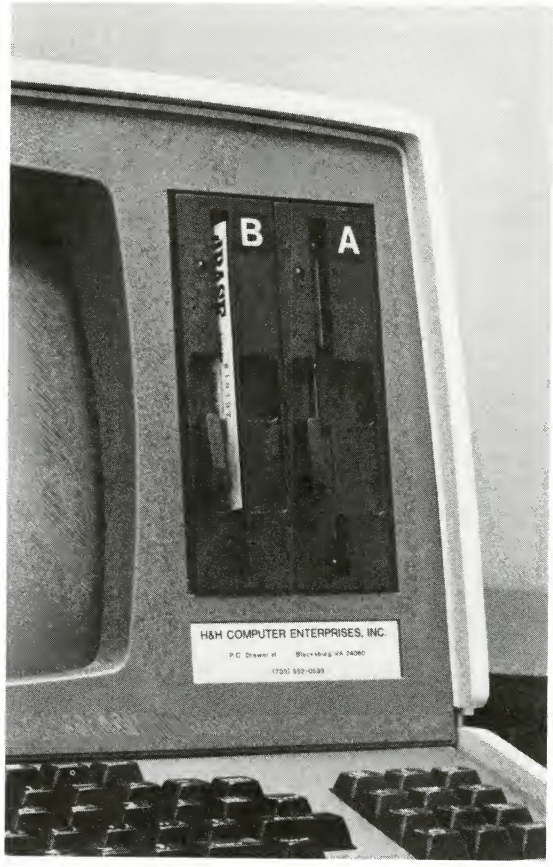

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system you have (H8 or H/Z89) so that I can send you the proper version; all H8 versions are supplied in 8080 code and H89 versions are in Z80 code."

Because of hardware limitations, we have not been able to test this game.

Exterminator
$19.50
Evryware
hard- or soft-sectored
H8, H/Z89, H/Z100
HDOS or CP/M
general
around one-half hour

Graphics	4
Adjustability	1
Cleverness	4
Complexity	4
Reasonableness	4
Intelligence	3
Hand-eye	4
Winnability	3
Heuristics	1

Description: "As hostile spacecraft drop Anthropod eggs, fire your remote-controlled bug blaster and pulverize them into space dust. Use the hidden passage in the twin towers of Yargon to fly an armed star-copter for badly needed supplies. Free fall from great heights or parachute to your awaiting hovercraft. Watch the Anthropods evolve, first into cocoons and finally into carnivorous creatures. Watch yourself be eaten alive if you aren't quick or clever enough!"
Comments: I found the rules unusually complex, perhaps because the scenario for the game seems more original and sophisticated than is usual for an arcade-style game.

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Froggs
$14.95
Apogee Software
hard- or soft-sectored
H8, H/Z89, H/Z100
HDOS or CP/M
general
around one-half hour

Graphics	3
Adjustability	1
Cleverness	3
Complexity	3
Reasonableness	3
Intelligence	2
Hand-eye	4
Winnability	3
Heuristics	1

Description: "At first, maneuvering your frogs across the four-lane highway and from log to log over the river to their havens is simple. It doesn't stay that way for long, though. The traffic becomes faster and heavier, the river more swift, and the logs less numerous. Deadly alligators and snakes appear, and pools of quicksand begin to line the riverbank. The turtles you ride upstream dive away underneath you. If you jump too often or too rapidly, your frog becomes tired and slow to respond. You can use the 'panic jump' button to get out of trouble—but if you use it now you won't have it later. And you must always remain alert for the chances to gain extra points, by escorting a lady frog home, or landing on a flower."
Comments: This is similar to the popular video arcade game.

Galactic Warrior
$19.50
Evryware
hard- or soft-sectored
H8, H/Z89, H/Z100
HDOS or CP/M
general
around one-half hour

Graphics	3
Adjustability	1
Cleverness	3
Complexity	3
Reasonableness	3
Intelligence	2
Hand-eye	4
Winnability	3
Heuristics	1

Description: "The dreaded Evils have launched a massive attack against your home galaxy. The Galactic Empire is in ruin, and most of its defenses have been weakened. Many have perished trying to stop these attackers. You are the best warrior in the galaxy, and the last hope for the Galactic Empire."

"Your mission as the Galactic Warrior is to stop the impending attack and destroy the Evils. You must engage the fleet of enemy star cruisers and destroy their space station. Use your deep-space missiles to break up the attack formation, and your short-range laser if an enemy fighter gets too close. Activate your protective force field to shield against enemy missiles, star bombs, and delta rays. As you come closer to the space station, the most skilled interceptors are dispatched. You must blast through the space station hull and make a direct hit on its central reactor."
Comments: Galactic Warrior is an Invaders-style game. You move along the bottom of the screen and blast your little alien buddies as they drop down towards you.

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Apogee Software
hard- or soft-sectored
H8, H/Z89, H/Z100; joystick supported.
HDOS or CP/M
general
around one-half hour

Graphics	3
Adjustability	2
Cleverness	3
Complexity	3
Reasonableness	2
Intelligence	2
Hand-eye	4
Winnability	3
Heuristics	1

Description: "The Federation's allies at the Schedar star system have been overrun. The Federation managed to eliminate the enemy fleet, but there remain the giant automatic missile-launching towers that the enemy constructed on the twelve planets of the Schedar system. Can you maneuver your ship, avoiding the treacherous terrain and enemy missiles, to destroy the deadly towers, while compensating for the constant downward pull of gravity? Only the finest pilot will be able to neutralize all the towers and free the people of Schedar."
Comments: You can disable the key click by running the program from CP/M as GRAV S.

Since the force of gravity is constantly acting on your ship, the maneuvering is somewhat more realistic and difficult than in the typical arcade-style game.

Gravitron II utilizes the Z100's color capabilities.

Invaders
$19.95
The Software Toolworks
hard- or soft-sectored
H8, H/Z89, H/Z100
HDOS or CP/M
general
around one-half hour

Graphics	4
Adjustability	5
Cleverness	3
Complexity	2
Reasonableness	3
Intelligence	1
Hand-eye	4
Winnability	3
Heuristics	1

Description: "Thought your computer couldn't do this? Think again. Your screen becomes a fast-action video game. Alien creatures try to land; you hold them off with your space cannon as you dodge their bombs. Play it as it comes, or customize with 23 user-variable parameters to increase the challenge; even design your own graphics."
Comments: In Invaders, as in The Software Toolworks' other games, it is very easy to modify the parameters of the game; you can make your cannon move

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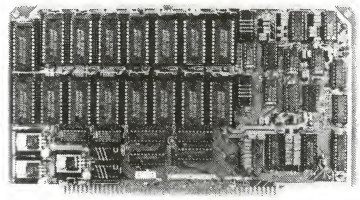

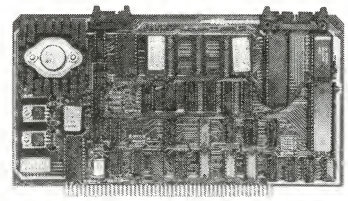

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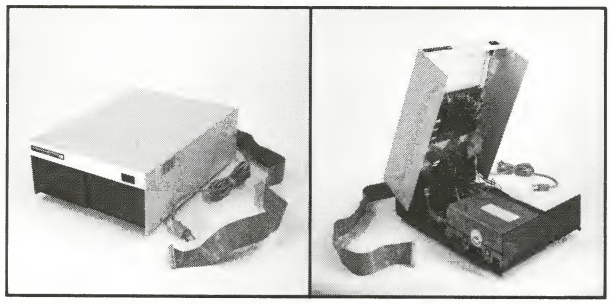

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faster, you can speed up your shells, you can speed up the aliens, and so on.

This implementation comes fairly close to the speed of the arcade-style games.

Invasion

Graphics	3
Adjustability	3
Cleverness	3
Complexity	3
Reasonableness	3
Intelligence	3
Hand-eye	4
Winnability	3
Heuristics	3

$17.50
Evryware
hard- or soft-sectored
H8, H/Z89, H/Z100
HDOS or CP/M
general
around one-half hour

Description: "Earth is under attack by an invasion from space. You have been put in command of Earth's defense. Will you save Earth from this unknown evil?"

"You have three powerful mobile missile launchers at your command, but they may not be enough to hold back the invasion. They drop wiggling bombs that explode on impact and they turn into radioactive fallout when you hit them. Will you survive? Will Earth survive? It's up to you."

Comments: Invasion has a demonstration mode.

Ladders

Graphics	3
Adjustability	4
Cleverness	3
Complexity	3
Reasonableness	3
Intelligence	2
Hand-eye	4
Winnability	3
Heuristics	1

$21.50
Jerry A. Phelps
hard-sectored
H8/19, H/Z89
HDOS 1.6, or higher, or CP/M 2.0, or higher.
general
around one-half hour

Description: An "arcade quality game; running in real time; entirely in graphics and animation. There are five floors connected by ladders and a vertical lift (which continuously moves up or down) that are used to move from floor to floor. Via the numeric keypad, the player controls a man who may walk, jump, or move from floor to floor on the ladders or the vertical lift."

Comments: Ladders is similar to the popular arcade game Donkey Kong. Ladders received a good rating for "adjustability" because you can select one of five speed levels.

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Lazer Blast

Graphics	3
Adjustability	1
Cleverness	3
Complexity	2
Reasonableness	3
Intelligence	3
Hand-eye	5
Winnability	4
Heuristics	2

$19.95
Universal Radio Company
hard-sectored
H8/19, H/Z89
HDOS 1.5, or higher, or CP/M (org-0 only). If supplied in NODOS format, no operating system is necessary.
general
under one-half hour

Description: "Alien spaceships attack your base from four sides, and your reaction with a laser cannon must defend the base. The random attacking waves come faster and faster to overwhelm your defenses. The top five scores for all times and the top five for that day's play are saved and displayed for friendly family competition."

Comments: You can point your cannon in only four different directions, but the targets always approach straight along your firing line, so you *will* hit your target if you're pointing in the right direction. The bad guys come in very fast; if you want to stay alive, you'll have to swivel your laser very, very quickly. Hence, despite its utter lack of strategy, this is a fast-paced and rather entertaining game.

Missile Control

Graphics	3
Adjustability	2
Cleverness	3
Complexity	2
Reasonableness	1
Intelligence	1
Hand-eye	4
Winnability	1
Heuristics	1

$17.50
Evryware
hard- or soft-sectored
H8, H/Z89, H/Z100
HDOS or CP/M
general
under one-half hour

Description: "You are under attack by a powerful enemy who is determined to destroy your six cities with guided missiles and bombs. Your only defense is missiles that you set to explode anywhere on the screen. The longer you survive, the more determined your enemy becomes."

"If you ever wanted to know what it feels like to be responsible for millions of (electronic) lives, now is your chance. Are you up to the challenge?"

Comments: Missile Control is similar to the popular arcade game.

Munchkin

Graphics	3
Adjustability	5
Cleverness	4
Complexity	2
Reasonableness	3
Intelligence	2
Hand-eye	4
Winnability	3
Heuristics	1

$19.95
The Software Toolworks
hard- or soft-sectored
H8, H/Z89, H/Z100
HDOS or CP/M; the graphics editing program Ed-A-Sketch might be useful.
general
around one-half hour

Description: "The author of Invaders does it again with a new arcade-style action game. You run through a maze, evading creatures which try to gobble you up. But turn the tables by reaching a force point, and you're energized to catch and destroy the baddies. Vary the skill level with user-alterable parameters; even create your own mazes (which requires Ed-A-Sketch program, not included)."

Comments: This is similar to the popular video arcade game, Pac-Man. Like Software Toolworks' other arcade-style games, Munchkin is unusually fast for a microcomputer-based game program.

Robot Battles

Graphics	3
Adjustability	2
Cleverness	3
Complexity	3
Reasonableness	3
Intelligence	2
Hand-eye	4
Winnability	4
Heuristics	1

$19.95
Apogee Software
hard-sectored
H8, H/Z89, H/Z100; joystick supported.
HDOS or CP/M
general
under one-half hour

Description: "For fifteen years, the Federation of Earth has repulsed the attacks of the deadly Cyborgs, a part-organic, part-robotic race with plans for galactic domination. Now, with inside help, the Cyborgs have stolen a copy of the firmware that controls the central computers at the heart of the Federation's defense system. You must infiltrate the control complex of the Cyborgs and remove the firmware before the Cyborgs can analyze it."

"Inside the complex you encounter roomfuls of drone robots blocking your way. You are armed with a blaster and a shield that will repel the robots' beams, but your weapons draw power alarmingly fast. Use your scanner to locate power installations to replenish your weapons. But move quickly; the Cyborgs are closing in, and against them your small weapons are useless."

Comments: Robot Battles was the only game to which I allowed myself to become addicted. I enjoyed the sense of progress I felt as I moved forward through the scanner matrix. Moreover, the level of hand-eye coordination required was just within my capabilities.

Snake

Not evaluated.

$19.95
The Software Toolworks
hard-sectored
H8/19, H/Z89
HDOS or CP/M
general
around one-half hour

Description: "Action video game. Easy to learn, with many variations and levels of difficulty, Snake is the perfect game for all members of the family. The snake moves about the screen, avoiding obstacles and eating food before it disappears. As it grows, quick reflexes and anticipation are needed to avoid a fatal collision. Increase the challenge by speeding up the snake, adding obsta-

cles, or moving to the Advanced game with bridges and a tunnel. The Progressive game dares the real expert to pile up huge scores by keeping the snake moving in the face of ever-increasing obstacles. Sophisticated scoreboard lets everyone compare their best scores. By Gerald K. Lunn."

Space Odyssey
$21.50
Evryware
hard- or soft-sectored
H8, H/Z89, H/Z100
HDOS or CP/M
general
around one-half hour

Graphics	4
Adjustability	1
Cleverness	4
Complexity	4
Reasonableness	3
Intelligence	4
Hand-eye	4
Winnability	3
Heuristics	1

Description: "The year is 2033. Man has long since left the solar system on many exploratory and often dangerous missions into deep space. The discovery of hyperwarp acceleration (2014) enabled man to explore vast areas of the Milky Way galaxy. Most of the galaxy has been charted, but several sectors on the outer reaches of the Orion cluster remain a mystery. A number of unmanned data collecting probes were sent into this mysterious cluster. Being the adventurous and daring person that you are, you have volunteered to hyperwarp into this area to explore and retrieve the probes."

"The front window of your spaceship shows a variety of natural and unnatural objects as they come at you in 3–D space. Use the navigational computer to find your heading and distance to the nearest probe. Vary your warp velocity to maximize fuel efficiency. Maneuver your ship around asteroids or vaporize them before they damage your shield. But don't vary too far off course or you may be lost in space forever!"

Comments: The simulation of forward motion into a three-dimensional space is rather convincing and highly entertaining. Managing your starship's resources (fuel, weapons, velocity, and course) calls for some intelligence and strategy, while the actual moment-to-moment operation of the starship calls for good hand-eye coordination and quick thinking.

Space Pirates
$19.95
The Software Toolworks
hard- or soft-sectored
H8, H/Z89, H/Z100
HDOS or CP/M; the graphics editing program Ed-A-Sketch may be useful.
general
around one-half hour

Graphics	3
Adjustability	4
Cleverness	4
Complexity	3
Reasonableness	3
Intelligence	2
Hand-eye	4
Winnability	4
Heuristics	1

Description: "You've drawn the duty at the Delta Pegasi IV space station, where grain barges await transport to the starving hordes of Earth. Raiders swarm in to steal the barges, and it's up to you to fight them off with your remotely piloted laser-equipped robot ships. The two-dimensional action is fast and furious—especially when the pirate juggernaut sails in to challenge you! Comes with three space station assignments providing different levels of difficulty, or use Ed-A-Sketch (not included) to create new ones."

Comments: The spaceships would be more threatening if they didn't look so much like little tadpoles.

The Wizards of Zeetle-Deet
$19.50
Evryware
hard- or soft-sectored
H8, H/Z89, H/Z100
HDOS or CP/M
general
around one-half hour

Graphics	4
Adjustability	1
Cleverness	4
Complexity	4
Reasonableness	3
Intelligence	3
Hand-eye	4
Winnability	3
Heuristics	2

Description: "The despicable Dante has turned the villagers of Zeetle-Deet into ghosts and imprisoned them deep in the earth. Deeper still is his stronghold, where he has caged Princess Karel. Become the good wizard Algernon and tunnel through the earth to save entrapped villagers, dodge demons, cast spells, or turn invisible and walk through solid rock with your companion, Prince Jason. Strategy and skill will defeat Dante and his demon horde. Then witness the touching reunion of Prince Jason and his Princess! For one or two players."

Comments: The action of the game combines strategy and hand-eye coordination in an enjoyable fashion. Moreover, the scenario for Zeetle-Deet is largely nonviolent, and, as far as I know, original—in both respects a welcome change from many of the games I've reviewed, which have all too often been mindless "blast-em-ups" based on popular video arcade games.

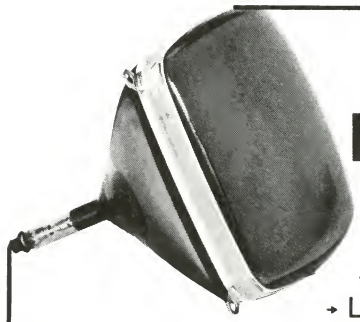
Y-Wing Fighter
$19.50
Evryware
hard- or soft-sectored
H8, H/Z89, H/Z100
HDOS or CP/M
general
around one-half hour

Graphics	3
Adjustability	1
Cleverness	3
Complexity	3
Reasonableness	3
Intelligence	3
Hand-eye	4
Winnability	3
Heuristics	1

Description: "You have been chosen to fly a Y–Wing fighter on a crucial mission to seek out and destroy the dreaded enemy's home base. The base is hidden in the mountains of an unexplored planet. Flying just above the ground, you will encounter a variety of unknown—and increasingly more challenging—dangers to test your skill to its maximum."

"You are shown a side view of your fighter and the terrain as it passes below, while you control your speed, altitude, and powerful front and rear phasers. If shot down, you can survive by gliding your crippled fighter to a safe landing. You can then make repairs and take off to resume your journey."

Comments: This is similar to the popular video arcade game Defender. There's a



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nice graphic display of the mountain range over which you pilot your Y–Wing fighter. One problem: Y–Wing seems to run a little slower than most of the other Heath/Zenith arcade games. Overall, though, the game is tactically challenging.

Interactive fiction

Evryware is the only Heath/Zenith supplier which sells interactive fiction, so it seems reasonable to let them define the genre: "Interactive fiction puts you in a literary setting—a narrated story in which you are a character. You can type in full sentences to make decisions and have conversations with the other characters in the story. Even after you have solved the story once, you can go back and try other approaches."

The object of an interactive fiction program is to tell the user/participant a satisfying story. This is fundamentally different from Adventure-style games, where the essential object is to induce the player to solve a series of puzzles. The literary settings are much simpler than a novel or even a short story, partly because the programmers can only display a screenful of text at a time. This is a shortcoming, but it's offset by your increased sense of personal involvement with the outcome of the story. The crucial difference is that you, the reader, are no longer merely a spectator. You make decisions, and you bear the consequences.

Evryware's programs did a good job of interpreting my "English-language" sentences. Interactive fiction programs can accept full sentences, not just the one- or two-word commands most Adventure games recognize. In order to "understand" the meaning of the sentence, the programs look for certain key words. The programmers seem to have done a good job of choosing the key words; even when I was deliberately trying to be confusing, the programs didn't make any grossly nonsensical replies.

I gave these programs relatively high heuristics scores. They are all written in listable MBASIC, so you can study Evryware's programming techniques (and modify the programs, if you so desire). It seems to me that there might be some worthwhile educational applications for interactive fiction. For example, the reader could be cast as a scientist trying to replicate a famous experiment: make the right inferences about nature, and you'll come up with the correct theory; make the wrong inferences, and you'll vanish into the scientific Bermuda Triangle reserved for alchemy, the Ptolemaic system, phrenology, and Lysenkoist genetics.

Dragons of Hong Kong
$21.50
Evryware
hard- or soft-sectored
H8, H/Z89, H/Z100
HDOS or CP/M; MBASIC
general
around one hour

Graphics	2
Adjustability	3
Cleverness	5
Complexity	3
Reasonableness	3
Intelligence	3
Hand-eye	1
Winnability	3
Heuristics	4

Description: "The story begins as you walk into Big Al's bar to meet Professor Goodman, who has just discovered a terrible secret. This secret takes you to the Far East, where you have a chance to free the world of an age-old blight, clear your name of a despicable crime, and finish the story wealthy beyond your wildest dreams."
Comments: I didn't enjoy *Dragons* as much as I enjoyed Evryware's other "book-length" interactive fiction, *H.M.S. Impetuous*. The primary reason, I think, was that the two stories take different attitudes toward their fictional genres. *H.M.S. Impetuous* is an affectionate tribute to C. S. Forester, whose Hornblower books defined their own subgenre of historical novels. *Dragons*, on the other hand, is a corny parody of a genre, the detective/adventure novel, which has already been parodied to death in countless books, movies, and TV programs. Why use a computer when you can just turn on a TV and watch "Get Smart"?

His Majesty's Ship Impetuous
$21.50
Evryware
hard- or soft-sectored
H8, H/Z89, H/Z100
HDOS or CP/M; MBASIC
general
around one hour

Graphics	2
Adjustability	3
Cleverness	5
Complexity	3
Reasonableness	3
Intelligence	3
Hand-eye	1
Winnability	3
Heuristics	4

Description: "*H.M.S. Impetuous* takes you back in time to the days when

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England's sailing ships ruled the seas. As the captain of the *Impetuous*, you must contend with a mutinous crew, treasure ships, and Napoleon's French fleet. Command decisions must be made, but careful—poor judgment on your part could send you and your ship to Davy Jones's locker."

Comments: *H.M.S. Impetuous* is modelled on C. S. Forester's Hornblower novels and, like the novels, poses some difficult questions about the ethics of command.

Six Microstories
$17.50
Evryware
hard- or soft-sectored
H8, H/Z89, H/Z100
HDOS or CP/M; MBASIC
adult
about 15 minutes each

Graphics	2
Adjustability	3
Cleverness	3
Complexity	3
Reasonableness	3
Intelligence	3
Hand-eye	1
Winnability	4
Heuristics	4

Description: "A good introduction to Interactive Fiction. You take part in six short stories, each with many outcomes." You can be a spy in Hitler's Third Reich; the pilot of a doomed 747; a financier trying to close a multi-million-dollar deal; a graduate student undergoing a Ph.D. oral exam; a wealthy socialite caught in a web of theft and intrigue; or even A Lonely Guy In The Big City.

Comments: When they say "microstories", they aren't kidding. Each of the six scenarios is quite short—you can only make two or three decisions before the story ends. Nevertheless, the scenarios are rather clever. I particularly enjoyed the story which requires you to answer the question, What is Art?

Simulator games

"I want to fly jets," Richard Gere said in *An Officer and a Gentleman*. An appealing fantasy—but few people will ever get a chance to pilot a modern jet aircraft.

Anyone with a microcomputer can purchase a simulator program which uses the terminal display to portray the most important instruments in an aircraft's cockpit. You can "take off" and "land," using the keyboard to control your throttle, elevators, and other critical systems. Your aircraft's altitude and speed change in response to your commands just as quickly as they would in midair.

(Jet aircraft are the most popular subjects for simulator programs, but two other highly complex technologies dealing with life-and-death are represented on Heath/Zenith systems: air traffic control and anti-submarine warfare.)

The sensation of "real-time" action is one of the distinguishing characteristics of simulator programs. You must have quick reactions in order to succeed. Moreover, you must have some "feel" for numbers. Simulator programs don't try to evade the fact that flying, air traffic control, and antisubmarine warfare are technical disciplines which call for skilled quantitative and analytic thinking. Using a simulator is a challenge; in return, you get an enhanced sense of accomplishment—and some "seat-of-the-pants" excitement.

Airport
$19.95
The Software Toolworks
hard- or soft-sectored;
8" CP/M
H8, H/Z89, H/Z100
HDOS or CP/M
adult
16-99 minutes

Graphics	4
Adjustability	4
Cleverness	5
Complexity	4
Reasonableness	5
Intelligence	4
Hand-eye	4
Winnability	3
Heuristics	4

Description: "In Airport, you are an air traffic controller managing the area around two airports. You must issue commands to the 26 airplanes that will appear during the course of the game, guiding each to the destination listed on its flight plan, while maintaining a high level of safety (that is, observing all relevant FAA regulations)."

"Your traffic sector is an airspace 23 miles square from ground level to 5,000 feet, and includes two navaids (navigational aids or radio beacons) and five airways. Your terminal screen simulates the controller's radar terminal, with graphics display features, if available, used to add clarity and realism. Airport is based on a game by David Mannering, a former air traffic controller, and pilots and controllers have noted its authenticity."

"What makes Airport so absorbing for an experienced player is the ability to anticipate the motion of the airplanes, and a mastery of the ways you can command the planes. As you start out, please remember that it will take some time and practice to learn these things, and the game will become more fun as you progress."

Comments: There is a separate configuration file, which allows you to change some of Airport's parameters.

A Flight Simulator
$24
Interaction Dynamics Systems
hard- or soft-sectored
H8, H/Z89, H/Z100
CP/M
adult
around one hour

Graphics	4
Adjustability	4
Cleverness	5
Complexity	5
Reasonableness	5
Intelligence	5
Hand-eye	4
Winnability	3
Heuristics	4

Description: "This is a simulator, not a game. It's tough, it takes some time to learn, and there is no canned 'flight plan' to follow to make it easy for you (and the computer). Using your full screen instrument panel mock-up, fly where you want and when you want, in either a glider, trainer, or 747. You define your runway and wind conditions, so when you get better, the going gets rougher. Instead of embellishments and cute displays, this program features some heavy aeronautical number-crunching. It's fast, accurate, and challenging. After making coordinated turns, using your incremental flaps, or precisely flaring the 747 in a dead-stick landing, you'll know you've been flying."

Comments: The graphics display uses the screen to simulate an instrument panel. You can adjust most of the important flight parameters (wind speed, runway length, etc.), and select from three different types of planes (glider, trainer, 747). As the *Description* warns, this is a challenging real-time

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Bottom: ... REMOVE SCREW ... REMOVE PANEL ...
Left: Leave alone, until you have pushed EMAG.
Right: A good place to start (the PLAN is here)
Front: ... ANALYZE BOLT ... ANALYZE IMAGE ...
Back: ... ANALYZE NUT ... BEND PLATE ...
Back: ... REMOVE SCREW (two from copper plate)

Circle #118 on Reader Service Card

simulation which will call for some serious analytical and numerical thinking; mastery will require practice, concentration, and skill. As to the "Reasonableness" score—aeronautics is based on physics, which is one of the most reasonable games we human beings play. Not being a pilot, I can't judge the real educational value of this game, but I can assure you that you'll *feel* as if you're learning something valuable.

Submarine
$24.95
Ralph W. Boyd
hard-sectored; other formats may be available upon special request.
H8, H/Z89, H/Z100; 64K RAM.
HDOS or CP/M 2.2x; MBASIC
adult
around one hour

Graphics	3
Adjustability	2
Cleverness	4
Complexity	4
Reasonableness	4
Intelligence	4
Hand-eye	4
Winnability	3
Heuristics	3

Description: "Submarine is a World War II combat simulation between a destroyer and an enemy submarine. You are in command of a destroyer and your video screen is your attack console. The screen has a linear sweep Sonar/Radar screen, ASDIC/Hydrophone section, Helm display, and Gun Fire Control status. Using the displayed information on your attack console, you must vector a course to intercept the evasive submarine during your high speed attack The game includes surface combat, ramming, abandon-ship klaxon sound effects (H8 HDOS version only), periscope/oil slick reports and other special events."
Comments: "The complete source code and instructions are supplied on each disk." One of my childhood passions was World War Two naval history, so I feel entitled to add that the simulation of anti-submarine warfare seems fairly realistic.

Strategy games

Chess-playing programs running on even the most powerful mainframes can't beat a human Grand Master. But microcomputer-based chess-playing programs can be good training for beginners and good competition for intermediate-level players.

Mychess
$34.95
The Software Toolworks
hard- or soft-sectored
H8, H/Z89, H/Z100
HDOS or CP/M
adult
variable

Graphics	3
Adjustability	5
Cleverness	5
Complexity	3
Reasonableness	3
Intelligence	5
Hand-eye	1
Winnability	5
Heuristics	5

Description: "Now you have the opportunity to own a true world class micro chess program, with full graphics. MYCHESS, best micro in the 1979 ACM North American Computer Chess Championship, and winner of the 1980 West Coast Computer Faire over such opponents as Sargon 2.5 and Atari, is now available for your computer. Nine skill levels tailor MYCHESS to any opponent. It plays varying openings from a 'book' of over 850 moves. Optional tournament time control. Can display suggested best line of play, record moves on printer. MYCHESS holds a USCF rating of 1568 (on 4 MHz Z80). By Dave Kittinger."

Slabs
$14.95
Friendliware
hard-sectored
H8/19, H/Z89
CP/M 2.2
general
around one-half hour

Graphics	3
Adjustability	3
Cleverness	3
Complexity	3
Reasonableness	5
Intelligence	4
Hand-eye	1
Winnability	4
Heuristics	3

Description: "Slabs is a graphic adaptation of the classic Towers of Hanoi problem." The player has three towers and *n* slabs of different sizes. Initially, the slabs are on tower #1, arranged in order of size, with the smallest slab on top, the largest slab on the bottom. One slab at a time may be moved from any tower to another, with the condition that no slab may be placed on top of a slab smaller than itself.

The player's objective is to move the pile of *n* slabs to another tower, arranged in the same configuration as initially.
Comments: This classic problem may be familiar to you from your mathematics classes.

Word games

Word games are an enjoyable way to use the computer to test and develop your language skills.

Acrobld
$14.50
William N. Tavolga
hard- or soft-sectored
H8, H/Z89, H/Z100; 56K RAM; printer optional but highly desirable.
HDOS or CP/M
adult
around one hour

Graphics	3
Adjustability	3
Cleverness	3
Complexity	4
Reasonableness	4
Intelligence	4
Hand-eye	1
Winnability	4
Heuristics	5

Description: "If you are a genuine fan of acrostic puzzles, you must, at some time, have tried to create one—using great heaps of scratch paper and/or erasers. Here is a program that does all the graphics for you. All you have to do is enter the phrase or quotation you want to use, and then go to work. The component letters are immediately displayed for you in alphabetical order. The program keeps track of every letter in every word clue, and beeps if you try to use a letter that has already been used or that is not present in the letter array. In effect, you have an infinitely erasable scratch pad, and you can store your work on a disk for later retrieval or make a hardcopy printout."
Comments: The difference between

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ACROBLD and ACROSTIC is that ACROBLD is intended to help you create acrostics, whereas ACROSTIC is primarily intended to help you solve them.

Acrostic
$14.50
William N. Tavolga
hard- or soft-sectored
H8, H/Z89, H/Z100;
printer is desirable but not essential.
HDOS
adult
around one hour

Graphics	3
Adjustability	4
Cleverness	3
Complexity	4
Reasonableness	4
Intelligence	4
Hand-eye	1
Winnability	4
Heuristics	5

Description: "This program will serve as an assist to the solution of acrostic word puzzles. It creates a graphic display of the puzzle pattern and the word clues and acts as an infinitely erasable scratch pad. Almost any acrostic puzzle can be loaded into the computer, and, as you enter the words from the word clues, the letters are automatically placed in the correct spaces on the puzzle pattern. Conversely, when letters are entered into the spaces on the pattern, they immediately appear in the word clues. Your work can be saved to a disk file at any point for retrieval later, or printed out complete. This program will not solve the puzzle for you (that would be robbing you of all the fun), but it makes the solving process more efficient and, we hope, even more enjoyable."
Comments: See ACROBLD, above.

Cross
$14.50
William N. Tavolga
hard- or soft-sectored
H8, H/Z89, H/Z100;
printer.
HDOS or CP/M 2.2
adult
around one hour

Graphics	3
Adjustability	4
Cleverness	3
Complexity	2
Reasonableness	4
Intelligence	5
Hand-eye	1
Winnability	4
Heuristics	5

Description: "This is a program that facilitates the creation of crossword puzzles. It can also be used as an aid to solving crosswords, especially of the diagramless forms. It makes extensive use of the graphics, cursor addressing, and special key functions that are features of the Heath/Zenith terminal."

"The program allows you to generate any pattern of squares from a minimum of 5 x 5 to a maximum of 23 x 23, and fill in the squares with letters, blanks, or fill-character on the computer screen. Cursor is moved by using the arrows on the keypad. The pattern with data in the squares can be saved to a disk file at any point, or retrieved from a disk file. The hardcopy output produces an enlarged form of the pattern and data, with appropriate squares numbered. A printer is necessary to run this program properly, since the pattern shown on the console does not have adequate space for numbering squares."
Comments: The first lesson I learned from using this program is that you can't just sit down and zip off a crossword puzzle. Even with computer assistance, it calls for some hard thought.

I gave CROSS a low score on "complexity" and a high score on "reasonableness", but I do recognize that crossword solvers may find this evaluation difficult to accept when they're looking for that elusive three-letter word meaning a large Australian bird.

Cryptaid
William N. Tavolga
hard- or soft-sectored
H8, H/Z89, H/Z100
HDOS or CP/M
adult
around one-half hour

Graphics	3
Adjustability	4
Cleverness	3
Complexity	3
Reasonableness	4
Intelligence	3
Hand-eye	1
Winnability	4
Heuristics	4

Description: "Here is a program that can assist you in solving the typical simple substitution cryptograms that are usually found in newspapers, magazines, etc. The actual solution is not done by the computer, but the computer just acts as an infinitely erasable scratch pad, and encourages you to make quick guesses. Your solution time is significantly decreased, as well as the drudgery of erasing, moving letters, etc..."

"...The line of instructions at the bottom of the screen lists the use of special keys to save or retrieve data from a disk, or request a hardcopy (uses driver LP: under HDOS)."

"This program can also be used to create cryptograms. Simply enter the plaintext instead of a cryptogram, and then choose whatever substitution characters you wish to make the puzzle confusing. Spaces between words are preserved, but otherwise you can use any printable character you wish."
Comments: This program is included free with any of the other Tavolga programs (CROSS, ACROSTIC, and ACROBLD). "The annotated source code in Tiny Pascal is supplied, so that if you have the compiler you can change the program to suit your needs."

Hangman
$29.95
SoftShop
hard-sectored
H8/19, H/Z89
HDOS or CP/M
general
around one-half hour

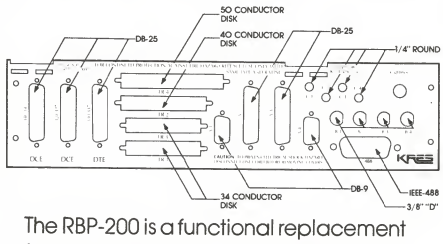
Graphics	3
Adjustability	3
Cleverness	3
Complexity	2
Reasonableness	4
Intelligence	4
Hand-eye	1
Winnability	4
Heuristics	5

Description: "These programs help you build a basic working vocabulary in a foreign language. Each contains over 2,000 words with their common English translations. You can play the traditional game of Hangman or have the computer present words in the Flashcard manner."

"When playing Hangman, ... an ongoing count is kept of the total number of correct words and the total number of words seen. Also, a display of the percentage of correct guesses is constantly updated so that you can measure your progress. At your option, the English translation can be given as a clue."

"When playing Flashcard, the computer displays a word in either the foreign language or in English (at your option). By hitting the RETURN key, the meaning of the word will be given. An 'Average Time' of your responses is displayed to let you know how fast you are progressing through the words. Also, a running count of the words flashed is kept."

Hangman uses the graphics capabilities of the terminal to do all foreign



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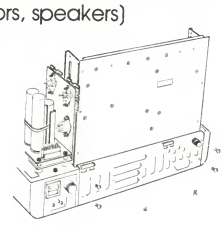

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Circle #128 on Reader Service Card

words, which include accent marks.

The program is available in French, Spanish, German, and Italian versions.

Comments: The German vocabulary file is an impressive 45K.

Word Wiggle
$29.95
The Software Toolworks
hard- or soft-sectored;
8" CP/M
H8, H/Z89, H/Z100
HDOS or CP/M
general
under 15 minutes

Graphics	3
Adjustability	5
Cleverness	5
Complexity	3
Reasonableness	3
Intelligence	5
Hand-eye	3
Winnability	4
Heuristics	5

Description: "Pit yourself against the clock and the computer in this scrambled letter game that builds word skills for young and old alike. Your screen displays a four-by-four square containing sixteen random letters. Score points by following adjacent letters to form words—the longer the better. Begin by competing against the lowest of the computer's eleven skill levels; then develop your vocabulary and agility until you can challenge its full 40,000 word dictionary. Experts will enjoy the possibilities of a five-by-five square, or change the time limit for more variety. Play against friends by repeating the same square, or enter your own letter pattern. Develop children's vocabulary by entering easy three-by-three squares. By Dr. Jim Gillogly."

Comments: Hand-eye coordination matters, because you are using the keyboard to enter your words as fast as possible.

Winnability is actually somewhat flexible, since you can set the computer at any one of eleven different skill levels. I beat the computer about half the time at skill level 5, the median.

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CP/M
general
under 15 minutes

Graphics	3
Adjustability	1
Cleverness	2
Complexity	2
Reasonableness	2
Intelligence	2
Hand-eye	1
Winnability	4
Heuristics	3

Description: WORDS is a game for several players. The program will ask you for a word; you type it in, and then the program will scramble it and display it on the screen. Now the other players can try to sort it out, beginning at the first letter. When they guess the correct letter, "it will be displayed as part of the word you typed in, and will be removed from the jumble."

"If someone guesses the word before all the letters are used, or gives up on the word, just press the RED function key to print it on the screen and move on."

Comments: There is a fundamental flaw with the rules of this game: the difficulty of each successive guess decreases factorially. For example, let's say the original word to be guessed is "FRED", and the scrambled version is "DERF". There are 24 (4!, or 4 x 3 x 2 x 1) possible arrangements of those four letters. However, once you have correctly guessed the first letter, "F", only 6 (3!, or 3 x 2 x 1) possible arrangements remain. And when you have guessed that the second letter is "R", then there are only 2 possible arrangements left (2!, or 2 x 1.) The better you play the game, the more quickly it becomes less challenging. Hence, WORDS is probably best suited for those who can ignore the complications and simply revel in the sheer visceral thrill of victory: i.e., children.

Miscellaneous

As you might expect, this category is something of a catch-all.

Dragon][
$19.95
Universal Radio Company
hard-sectored
H8/19, H/Z89
HDOS; MBASIC
general
around one hour

Graphics	4
Adjustability	4
Cleverness	4
Complexity	2
Reasonableness	3
Intelligence	4
Hand-eye	1
Winnability	4
Heuristics	4

Description: "A maze game employing H/Z89 graphics to display the appearance of passageways while you are wandering in the maze and a dragon is after you. Random mazes and a dragon sniff factor that won't let go make it necessary for you to use your small supply of magic commands to avoid being eaten."

Comments: The programmers of Dragon][deserve special credit for the clever way the program uses perspective to simulate three-dimensionality. When you look at the '19 graphics display, you see what you would see from your ground-level position in a maze. This is one of the closest approximations I've seen of true three-dimensionality with H/Z19 graphics.

You can adjust the complexity of the maze which Dragon][creates for you to solve. Moreover, Dragon][is a listable BASIC program, so you can study its maze-generating techniques.

Eliza
$18
J. E. Brancheau
Engineering Co.
hard-sectored
H8/H19, H/Z89
HDOS
general
around 30 minutes

Graphics	1
Adjustability	1
Cleverness	2
Complexity	2
Reasonableness	2
Intelligence	3
Hand-eye	1
Winnability	2
Heuristics	2

Description: See the listing for The Software Toolworks' ELIZA, below.

Comments: It was too easy to get this version of Eliza to fail the Turing test.

Only a couple of sentences into the conversation, the program said something flagrantly ungrammatical. This made it obvious that there was a computer on the other end of the terminal—*not* a human being.

A couple of minor beefs: there's barely one page of documentation; and ELIZA communicates only in unsightly uppercase letters.

Eliza
$24.95
The Software Toolworks
hard- or soft-sectored;
8" CP/M
H8, H/Z89, H/Z100
HDOS or CP/M
general
typically, around one hour

Graphics	2
Adjustability	5
Cleverness	4
Complexity	2
Reasonableness	3
Intelligence	3
Hand-eye	1
Winnability	3
Heuristics	4

Description: "You won't believe it's a computer! ELIZA carries on a conversation with you in plain English. Great for playing alone or at parties, ELIZA is the perfect way to show off your machine to friends. Not just a game, but a faithful recreation of the original artificial-intelligence program. You can play it or program it, using any text editor to modify the script or create completely new ones. Comes with the complete original DOCTOR script which converses like a psychiatrist, plus an improved version of DOCTOR. Documentation includes full instructions for script writing, plus the original ELIZA research paper."

Comments: ELIZA is an implementation of the famous artificial intelligence

① H89 — H8

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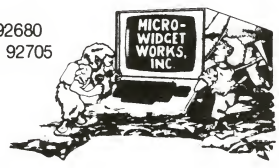

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Circle #131 on Reader Service Card

program developed in the early 1960s by Joseph Weizenbaum of MIT.

Games #1
$19.95
Interactive Micro Systems
hard- or soft-sectored
H8, H/Z89, H/Z100
HDOS or CP/M
general
around one hour each

Graphics	3
Adjustability	2
Cleverness	3
Complexity	3
Reasonableness	3
Intelligence	4
Hand-eye	4
Winnability	3
Heuristics	3

Description: "Gomoku is a strategy game which is very similar to tic-tac-toe, only on a much larger scale. Gomoku is played on a 19 x 19 board, and the first player to get 5 pieces in a row wins."

(*Sextant* readers: can you demonstrate a winning strategy for such a game?)

"Concentration is similar to the TV game of the same name."

"Maze-Dash is a video game where you must maneuver your way through a randomly generated maze by using the arrow keys on the H19/89 keyboard. There is a time limit, so you must hurry!" The mazes vary in difficulty.

"Solitary is a puzzle where you remove pieces by jumping over them with other pieces. The object is to remove all but one of the pieces from the board."

"Barricade is a video game where you must maneuver your barricade and block the three barricades controlled by the computer."

Match
$29.95
Friendliware
hard-sectored
H8/19, H/Z89
CP/M 2.2x
general
around 30 minutes

Graphics	3
Adjustability	2
Cleverness	3
Complexity	3
Reasonableness	3
Intelligence	4
Hand-eye	1
Winnability	4
Heuristics	4

Description: "Tests and measures pattern recognition, concentration, and short-term retention. Interesting graphics in a 77-object matrix. Each new puzzle is a rapidly generated, randomly distributed, hidden collage of 38 paired objects and one odd one. A puzzle is solved by exposing pairs to isolate the odd one. Matched objects remain visible until only the odd one is left and automatically revealed. Attempts to match are monitored, and with each solution a current success rating and up to nine previous ratings are given."
Comments: This is similar to the old TV game show Concentration.

Quiz Gallery
$14.95
Siebert Ickler
hard-sectored
H8/19, H/Z89
HDOS
under 30 minutes
children

Graphics	3
Adjustability	3
Cleverness	3
Complexity	3
Reasonableness	3
Intelligence	4
Hand-eye	4
Winnability	3
Heuristics	5

Description: The player alternates between answering questions and shooting a cannon at targets flying by overhead. When the player answers questions correctly, the cannon receives more "ammo."

Sample sets of questions are included: an arithmetic drill, a typing drill, and a quiz on the states' capitals. Instructions are provided to enable you to make up your own sets of questions and answers.
Comments: The targets are small and move rather fast; the hand-eye coordination required is not trivial.

Startrek
$24.95
CyberSoft
hard-sectored
H8/19, H/Z89; 56K RAM.
HDOS 1.6 or 2.0, or CP/M 2.2; MBASIC
general
typically, one hour plus

Graphics	3
Adjustability	3
Cleverness	3
Complexity	3
Reasonableness	3
Intelligence	4
Hand-eye	4
Winnability	3
Heuristics	3

Description: "This new game from CyberSoft pits the *Enterprise* against Klingons in an interstellar combat game using the features of your H19 or H/Z89 to graphically display Short and Long Range Scans, Galactic Record, Ship Status, Damage Control, and Commands and Messages."

When you play Startrek, you give the computer commands instructing it to move your starship around the galaxy by using your Warp Drives, or telling it to search for Klingons with your scanners. When you encounter Klingons, you use your deflectors for defense and your phasers and photon torpedoes for attack.
Comments: The generic Startrek game is one of those games (such as Adventure) which have migrated to almost every mainframe computer in the world. Incidentally, do any *Sextant* readers happen to know where and when the original Startrek game was created?

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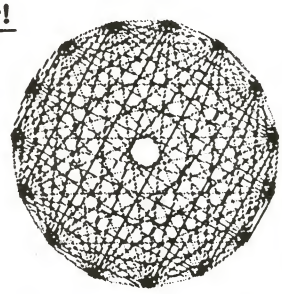

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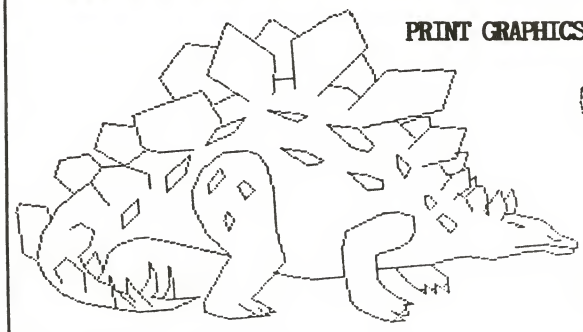

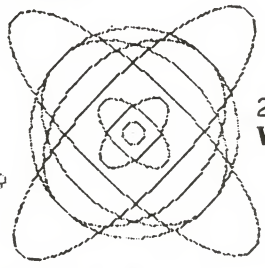

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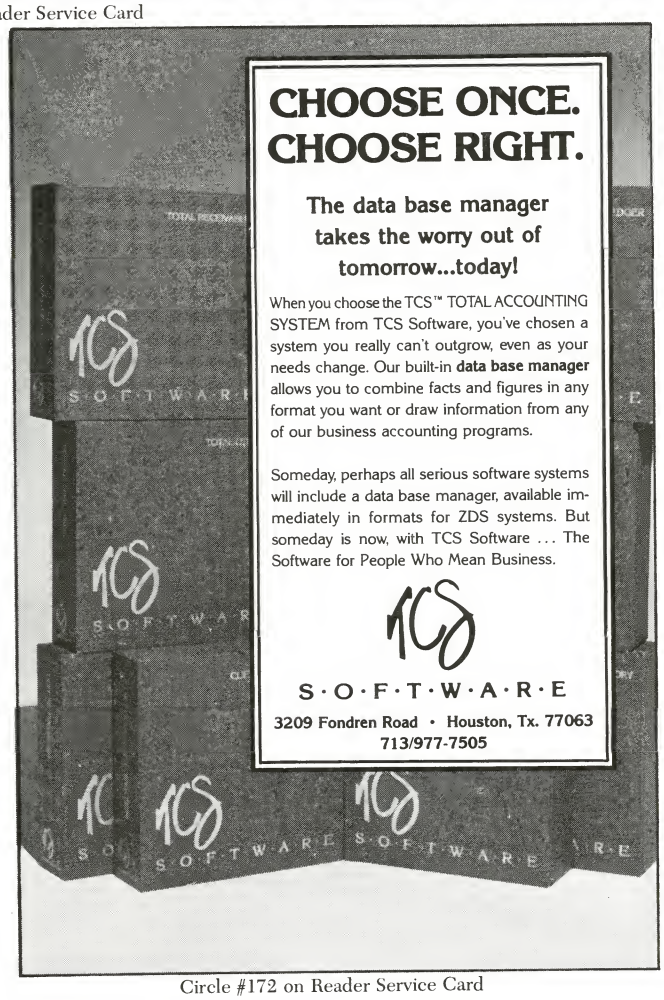
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Circle #172 on Reader Service Card

Adding 16K Memory to the '89—A Low-Budget Alternative

If you can build the H89, you can build this memory-expansion board.

Wayne Rash, Jr.

Like many of you, when I built my H89 computer, it came with 48 kilobytes of random-access memory (RAM). Not long afterward, I realized that a 64K memory was required to run most of the programs that I needed.

Unfortunately, the cost of the Heath version of the 16K expansion board ($115, assembled) made the purchase of additional memory seem unlikely in the near future. A quick review of *Sextant* advertisers revealed, though, that the additional memory was less expensive than I had originally thought. The least expensive of these add-on systems was produced by J. C. Williams of Buchanan, Virginia.

For $21, Williams will send you a circuit board that will give you the memory you need, as long as you're willing to add the rest of the parts and do a little soldering. Having constructed the board, I can assure you that you do, indeed, get memory expansion for your '89 at a very low cost. If you have to buy all of the parts needed, you will spend a total of less than $50 to complete the project—including the cost of the board.

I should note that this project is not as easy to build as many small Heathkit projects, and an inexperienced builder may find it fairly difficult. The advertisement for the board says that if you can build the H89, then you can build this board, and for the most part that's true. You will find, however, that the density of the printed circuit board is fairly high, and it takes a careful touch to build it properly.

On request, Williams will send you a parts list, so that you may gather everything that's required for construction before the board arrives. Most of the parts are easy to find. I purchased practically everything I needed from JDR Microdevices in San Jose, California. All I got locally were the DIP jumper cable and the connectors for the central processor unit (CPU) board. Those I found at the local Heathkit Electronic Center.

Some care is needed

Once the parts are collected, construction proceeds in an orderly manner with few significant problems. The instructions are clearly written, and include drawings of the assembly and a schematic of the board. They do not lead you through each individual step for each part as the Heathkit manuals do; but they are perfectly adequate to construct the board.

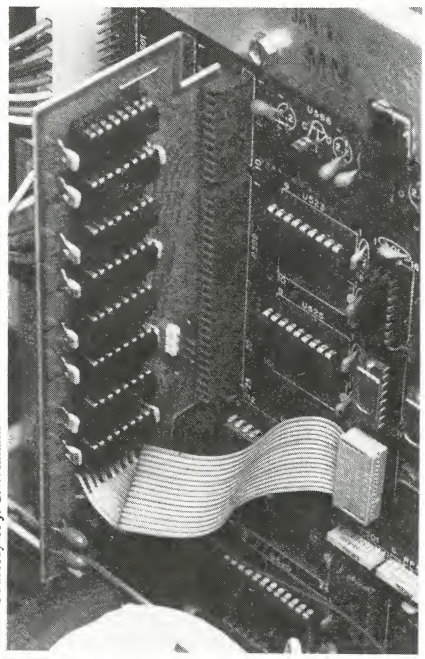

Photo Courtesy of J. C. Williams

The J. C. Williams memory-expansion board plugs into the left side of the H/Z89. It uses connectors P503 and P509 on the '89's CPU board.

The only serious problem with the assembly of the board came in step 4 of the instructions—where the 0.1 microfarad (uf) capacitors are installed on the circuit board. The capacitors I received from the supplier had leads that were too big for the predrilled holes in the Williams board. A few minutes with a Dremel tool and a dentist's bit solved the problem. But someone without these tools would have difficulty completing the board. I contacted Williams about this problem and I understand that a change to correct this has already been incorporated.

The only other area where a fairly inexperienced builder may have problems has to do with the board itself. As Williams explains in his literature, this circuit board is not solder-masked. For that reason, solder bridges are difficult to prevent. Even experienced builders will have an occasional solder bridge, due to the proximity of the foil traces to each other. The easiest solution to this is to keep a roll of Solder-Wick handy and to use it when necessary. It also helps to check your work frequently.

A couple of hours' work

Construction of the board went fairly quickly. Even a cautious builder should be able to complete the entire project in a couple of hours, once the parts are on hand. The single most time-consuming step in the whole kit involves the preparation of the DIP jumper that runs from the memory board to the CPU board. Unless you can find a six-inch cable with connectors on both ends, you must prepare one end of the jumper cable and solder it into the memory board. While this is not difficult, the job requires careful attention and should not be rushed.

The rest of the construction is very straightforward. First a dozen jumper wires are installed, followed by the sockets for the memory chips, the capacitors, the voltage regulator, and the connectors. After a careful check of the foil side of the circuit board, the 4116 memory chips are installed and the board is ready to go into the computer.

Williams' memory expansion board plugs into an existing expansion location on the left side of the CPU board. One of the existing memory chips is removed from the CPU board, and the DIP jumper is plugged into the resulting empty socket. The memory chip that was removed is installed in the memory board. (On some older H/Z89s, a jumper wire is plugged into an extension of jumper location JJ–503 and installation is complete. It should be stressed that newer '89s do not need this jumper.) The last thing you do before checkout is to reposition a jumper at JJ–504.

If you did everything right, checkout is almost an anti-climax. You turn on the computer and are greeted by two beeps. You then type in the same memory test you used when you built the computer,

Parts List

Quantity	Item
1	Memory Expansion Circuit Board
8	4116 memory chips, rated at 200 nanoseconds
1	79L05 voltage regulator
1	Heath 432–1074 connector
1	Heath 432–1076 connector
3	wire-wrap pins (may not be required)
12	0.1 microfarad ceramic capacitor
3	2.2 microfarad tantalum capacitor
1	16-pin DIP cable, 6 inches long

I purchased the DIP cable and the two connectors at the local Heathkit Electronic Center. All of the other parts can be found at a well equipped electronics supply store. I found the parts I needed at JDR Microdevices, 1224 South Bascom Avenue, San Jose, CA 95128.

and the computer responds with LWA=377377, which is its way of telling you that you have a 64K H/Z89. The test goes through passes 0 to 377, and if all is well you are ready to go.

If all does not go well, the memory address of the error will be displayed. Williams adds several hints to help locate any problems. Most frequently, the problems are due to solder bridges or other construction-related difficulties. However, it is also possible to have a defective memory chip—and Williams tells the builder how to track down this particular problem as well.

The density of the printed circuit board is fairly high, and it takes a careful touch to build it properly.

And you get your memory

Overall, I was pleased at the ease with which the memory board went together. While a certain amount of care is required, it is true that if you can build an H89, you can handle this project.

I'm sure that this project could have been made slightly easier through the use of a solder-masked double-sided circuit board. This would have eliminated the problem with solder bridges and the need to install jumper wires, but it would also have raised the price of the board substantially. For me, one of the attractions was the low price and the ability to use some parts I already had on hand.

If you are reluctant to tackle a project like this, or simply do not want to wait until you can track down all of the necessary parts, Williams will also sell you an assembled version of the same board for about $60. The assembled board is hand-made, and is very well done.

If you need 64K of memory for your H/Z89, and you don't want to pay the going price at the Heathkit store, I would strongly recommend that you consider the J. C. Williams memory-expansion circuit board. It makes for a very enjoyable project—and when you are finished, you have a memory board for about the lowest cost anywhere.

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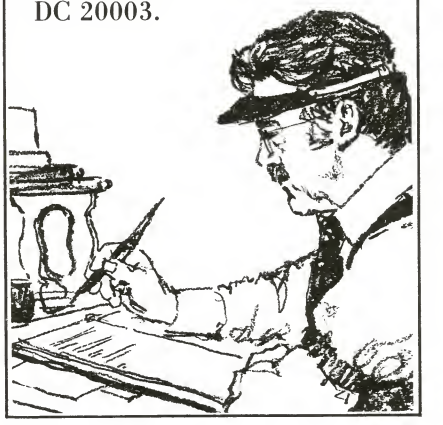

How to Use: Zenith/Heath Computers, by Hal Glatzer

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Published in December 1982
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Magnolia's new version of the CP/M operating system offers improved capabilities for Heath/Zenith users operating with Magnolia hardware.

Kirk L. Thompson

Choosing an implementation of CP/M for the Heath/Zenith '89 is not a simple matter. I discovered this the hard way about two years ago. It was then that my desire for full-featured word-processing software prompted me to get this widely used operating system.

I discovered that there are, in fact, *three* sources for 8-bit CP/M: Lifeboat Associates in New York, Magnolia Microsystems (MMS) in Seattle, and Heath/Zenith (of course).

I quickly eliminated Lifeboat's version from contention. It was not only an older version, but decidedly non-standard. (See the comments titled "The ROM Switch" accompanying this article.) After some correspondence with Heath's technical consultants and with Magnolia, I finally opted for Magnolia's implementation. I selected that one principally because I could preserve the cassette input/output (I/O) board in my system with it, but couldn't with Heath's version. (I use the cassette system principally for archiving.)

Although I originally got Magnolia's version 2.23, I recently upgraded to 2.24. I quickly discovered that this new version is *not* just another adaptation. In fact, it rises head and shoulders over the older one. In the remainder of this review, I will make frequent comparisons between these two, as well as with Heath's version 2.2.03, with which I have had some contact. (I might note that I am running three of the old Siemens single-sided, single-density 5" drives for 90 kilobytes capacity each, under CP/M. One of the quirks that I will note in Magnolia's implementation is a result of these drives !)

Getting the system up

Getting the system up is no particular problem; and since Magnolia's instructions are very detailed, I will not repeat them here. But the options the system includes are impressive. If you are running a number of disk-drive types, or more than one controller, it can get a little hairy. Drive options are set up as modules you can link into CP/M as you wish. Magnolia can supply upwards of 50 of these linkable modules as standard, depending on your hardware. These drive modules range from the low-end H17-type (such as mine), through five- and eight-inch double-density, to two hard-disk systems. Besides the H17, Heath-compatible modules are also available for the H37 and H47 drives.

As an example, the two distribution disks which I received contained modules for both the H17 and H37. The number of modules is actually double what you might expect, since MMS includes drivers and boot routines for each drive system. Each of these may be linked into the operating system. The distribution disks come already configured for your basic hardware. Hence, you can get it up and running without much fuss or bother if you only have one drive type. If, however, you have a mixed system, things are a bit more difficult. But they're not overly so, because of the configuring utility which Magnolia supplies.

Configuring the system

MMS provides a number of utilities over and above those provided either by Heath or by CP/M's producer, Digital Research. One of them is SETUP.COM, and it is an exceptional utility for configuring the system. It stands out above those supplied by either Heath or Digital Research. The latter two only have STAT.COM to display the physical and logical devices provided by the system and MOVCPM.COM to patch a new configuration into the system. MMS's SETUP.COM utility allows you to set baud rates for the input/output (I/O) and handshaking. It also allows you to set the complete gamut of disk drive options: disk size, number of sides, track density, recording density, and step rate. If you have a mixed system, CP/M's drive names can be assigned to specific physical drives and the boot drive can also be set.

As you might expect, the only exception to this flexibility is that single-density read/write format on H17-type drives cannot be altered. In this regard, Heath's H17 controller still remains in charge. However, the tracks per inch and number of sides *can* be altered!

Besides being flexible, setting things up under this utility is unique in my experience. You don't enter a letter or number from a menu, as you would do with Heath's CONFIGUR.COM. Instead, you

The ROM Switch

One of the problems with implementing CP/M on any Heath 8-bit micro is the existence of the read only memory (ROM) monitor in the bottom 8K of memory. Lifeboat Associates, in their version 1.4, chose to leave the monitor intact. Hence, they placed the beginning of user RAM at 2280 hex, instead of at 100 hex where the first page of user RAM starts under standard "org–0" CP/M.

This approach has distinct disadvantages. To begin with, you have a non-standard system, so you are stuck with basically one software supplier. Also, knowledge of assembly language and CP/M's DDT debugging and patching program would be essential to adapt any other software you might acquire for your system from other sources.

However, Magnolia, and then Heath, decided to switch out the ROM in their implementations. When you turn on your system, it comes up as it would for HDOS, with the monitor active. After you type "B" (for BOOT) and RETURN, the bootstrap routine in ROM loads the boot track from disk. While executing the routine on the boot track, the ROM is switched out, leaving only RAM active. The top 8K of RAM is also switched to the bottom.

On systems with the "org–0" CPU board, which means all units built over the last several years, this is basically the way that CP/M, in either implementation, will boot. The status of the system is indicated by bits in port 362Q (the port that reads the system-status DIP switch, SW501). Heath simply uses one of these bits as a toggle. But, if you have an older system such as mine (dating to the Fall of '79), MMS supplies a solid state latch on a small board which plugs into the central processor unit (CPU) board. See the comments titled "Magnolia's Latch Board" for a description of this board and its installation. This latch, working off two bits in the port, ensures that any activity at that port does not inadvertently modify the memory map and crash the system.

move the cursor to the option on the display you wish to alter, using the keys on the software-shifted keypad.

Then you key in the changes you want. Allowable alternatives are displayed on the screen for each option as you move the cursor around. Finally, you hit one of the colored special function keys at the top of the keyboard to quit with no change, to patch MOVCPM, or to return to the distribution configuration. This greatly simplifies getting the system up and running, especially if you don't have much experience with CP/M or if you don't have a mixed bag of drives.

With Digital Research's STAT.COM, you can display the actual physical devices assigned to the logical devices which CP/M recognizes. Typing "STAT VAL:" shows the possible assignments; typing "STAT DEV:" displays the actual assignments implemented by Magnolia. For most new users, reassignment will not be necessary, since MMS has set the console, printer, and modem ports to those used under the Heath Disk Operating System (HDOS). Therefore, if you are already running HDOS, or plan to, no changes are necessary!

I might also note that with the new version, Magnolia implements all three ports on the serial I/O board, compared with the two they used in the older version.

Other utilities and information

As I said, Magnolia provides a number of utility programs over and above those supplied by Digital Research. I have only mentioned one of them so far, SETUP.

MMS also supplies a disk formatter, FORMAT.COM, with a drive configuration display to ensure that disks are properly formatted on a mixed drive system. FORMAT also displays the status of its operations as it proceeds, for both formatting and verifying. MODE.COM displays and modifies drive configuration on an individual basis. Hence this utility could be used to temporarily reconfigure a double-tracked (96 tracks per inch) drive, such as a Tandon, to read (but not write) a single-tracked (48 t.p.i.) disk.

Three copy programs are also provided. Two of these are intended for use only on single-drive systems. For copying between two disks, FILECOPY.COM is a single-drive alternative to PIP.COM and requires the alternation of source and destination disks. ONECOPY.COM works the same way, but is a whole-disk copier. COPY.COM is a multidrive whole-disk copier, much like the Heath Users' Group's well known DUP.ABS (running under HDOS) or the DUP.COM utility supplied with Heath's implementation of CP/M.

For those interested in setting up a CP/M system almost from scratch, Magnolia supplies not only the disk I/O modules mentioned above and LINK-COM, the linker program, but also BASECPM.COM. This is the system primitive containing those elements that would be necessary to any configuration: the Basic I/O System (BIOS) core, Basic Disk Operating System (BDOS), and Console Command Processor (CCP). In order to run this primitive, your disk I/O modules *must* be linked to it.

If I should expand disk storage by going to double-sided and/or double-tracked drives, all I would have to do is patch MOVCPM with SETUP and resysgen my disk library.

Magnolia provides too many miscellaneous utilities to mention them all. The most important are probably LIST, DRIVES, CLEAR, and TPA. LIST.COM accepts a number of parameters for displaying the directory. DRIVES.COM is used at the beginning of operating system implementation to identify which drive types are actually a part of your hardware. CLEAR.COM clears the disk directory so a disk can be re-used without having either to reformat it or to use STAT to change any read-only files to read/write before ERASing them. TPA.COM reports the size of the "transient program area."

Magnolia also provides substantial independent documentation: a short programmer's guide for those who wish to make minor changes to the operating system; disk formats and disk storage requirements for the operating system; track and sector allocation for disks; memory maps; and details for interfacing various printers. Unlike version 2.23, most of these last do not require short adapter cables or modification of the printer interface cables.

The older version made things a bit difficult if you wanted to run a printer under both CP/M and HDOS because of conflicts in handshake wiring. Now, handshaking patches can be made with SETUP.COM; and most printers can be plugged in directly, without any cable rewiring. The only exceptions listed in the documentation are the NEC 5510 and 5520 Spinwriters, TI 810 (if not supplied by Heath) and 820, Epson MX–80, and Okidata Microline u82A and u83A. These six require, at minimum, an adapter cable, unless you are willing to accept significantly reduced speed.

Enhancements

I mentioned at the beginning of this review that Magnolia's version 2.24 is not a run-of-the-mill implementation. This is because of the enhancements provided over and above the basic operating system supplied by Digital Research. Most of these are in the CCP, but there is also an important one in the BDOS: using SETUP.COM, any drive can now be configured as read-only.

An optional enhancement for the BIOS is an interrupt-driven routine for the console in the form of a linkable module. It basically provides a type-ahead buffer. You may clear this buffer by hitting the "BREAK" key, one of the few uses I have seen for that key. (Note that this is different from the BREAK key's use in Heath's 2.2.03; see immediately

Magnolia's Latch Board

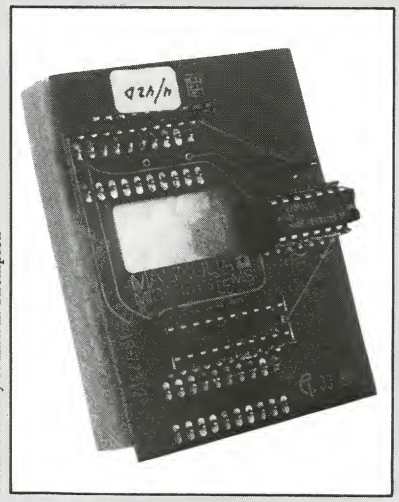

Photo Courtesy of Kirk L. Thompson

Figure 1 shows the solid state latch board which Magnolia supplies (MMS #77312) to convert older '89s to "org–0" CP/M. Note that if your micro is already "org–0" compatible, you do *not* need this board! On the other hand, if you do, indeed, have older equipment, this is without doubt the best way to go. Magnolia's instructions for the board's installation are very clear. However, I will note that, contrary to their instructions, the CPU board should be removed before installing the latch. The '89 is otherwise a bit too cramped inside to reliably remove and install integrated-circuit (IC) chips. I might note, as well, that Heath's implementation of CP/M will also boot from this board.

below.) This module was already linked into my system when it arrived, but if it creates problems for any application programs, it can be deactivated with either STAT or SETUP. The remaining six enhancements are in the command processor.

Of these, half are completely new commands!

RES resets the system—so you don't have to use CTRL-C to do a warm boot. (Heath's implementation uses the "BREAK" key for this.) RES is faster than CTRL-C and does not require that a disk containing the operating system reside in the boot drive. Just be sure that the new disk is in the boot drive before entering the command. This new command really made regenerating my disk library much easier after I implemented the new system.

Another new command is CLS; it clears the console screen. But probably the most important enhancement is PRNT. This new command dumps an ASCII file to LST: while generating formfeeds every 62 lines and expanding tabs. It essentially does for the printer what the TYPE command does for the console.

The remaining enhancements improve already existing commands. The user area number is now included in the prompt. Hence, if you were logged into user area 3 on drive B:, the prompt would look like "B3>". The DIR command and directory display have also been improved. The DIR command has an additional parameter, @, which will display *all* files on a disk in the logged drive, not just non-system files. The directory now also inserts a period between a file name and its extension, and eliminates the spaces between the two which were typical of the older display. ERAse also shows the names of any files deleted. And SUBMIT looks for its command file, $$$.SUB, on the currently-logged drive instead of only on the boot drive.

Quirks in the implementation

Magnolia's CP/M–80 has a few kinks. The first that I shall note are in the documentation. The special features of the implementation are very well described. I did, however, note two minor slip-ups. The description of the SETUP utility does not mention that the left and right cursor control keys on the shifted keypad must be used to move the cursor to the available options while configuring your system. These keys are also not included in the command summaries in the utility itself. When I worked with the keys, I observed that they TAB the cursor over to the appropriate columns. I am told by Magnolia, however, that this omission only exists in the version for the H17-type drives and will be fixed in the next update.

I also noted that, in the final generation of a copy of the distribution disk, the SIZE of the system does *not* have to be entered while running MOVCPM.COM. This created some confusion for me since the earlier version, and Digital Research's documentation, required it. Magnolia no longer needs it since the size of the system can be obtained from the hardware. I think it would be less confusing if the documentation for the system generation procedure noted that this is not required.

The system itself has a quirk which I suspect is confined to the H17 version. The disk drive's LED, which indicates that the drive is accessing the disk, stays on for an unusually long period of time *after* the next prompt appears on the screen. This would not normally be a

If You Use Both HDOS and CP/M

If you plan to run both HDOS and CP/M, there are a number of utilities available for transferring files, especially ASCII files, between the two systems. I am using CPMCOPY.ABS and HOSCOPY.COM, the pair by J. J. Thompson. (No relation!)

The kink with (at least) this particular pair is that the volume number of the HDOS disk that you want to copy a file from under Magnolia's CP/M *must* be 000; otherwise, you will get a BDOS error! The reason for this, apparently, is that the byte on the disk which contains the volume number under HDOS holds the side number under CP/M. It's a little difficult to get 255 sides on a diskette!

The only way to get the needed HDOS volume number is by either duplicating a system distribution disk and erasing the files on it or (horrors!) sacrificing the original. I opted for the latter since my system is old enough to have an archived distribution disk for HDOS version 1.5. I am presently using this erased disk for *all* transfers between the two operating systems. (Heath's version 2.2.03 does not require this, according to Magnolia, because it is somewhat non-standard in this regard.)

Switching Between HDOS and CP/M

If you switch between HDOS and CP/M during one session at the terminal, you should execute a system reset before going from one to the other. If you have done little in the way of "improving" HDOS, it is possible to boot directly from HDOS version 2.0 to CP/M.

Before I added HUG's SY: disk driver, I was able to boot up CP/M with no difficulties after HDOS's "Install a bootable disk...." prompt. However, if you have this driver, the system reset is mandatory going both ways. CP/M resides permanently in memory, no matter what you do with the disks. Therefore, you need the reset when going to HDOS. But although HDOS is not, for all practical purposes, permanently resident, HUG's driver sets a byte in low memory which makes it impossible to boot CP/M directly. A system reset returns that byte to a bootable configuration.

Learning More About CP/M

If the user wants to dig into the usage or features of the basic CP/M system, the only information provided is that from Digital Research. I have not seen the newer manuals just released, so I cannot make any kind of judgement on them. But the older documentation leaves much to be desired. For a newcomer to the operating system, if you do not have the new manuals, the only recourse may be to buy one of the now-proliferating primers on CP/M.

Of the ones I have seen, the best is Fernandez and Ashley's *Using CP/M: A Self Teaching Guide* from John Wiley and Sons (1980, 240 pp.). But even this book, while doing a good job of teaching you the basics of the system, doesn't even touch on the use of ASM.COM, the assembler which comes with CP/M. Substantial aid in programming under CP/M is provided by *Inside CP/M: A Guide for Users and Programmers: with CP/M–86 and MP/M 2* by David Cortesi (Holt, Rinehart and Winston, 1982, 571 pp.). This last is a textbook and may be a little hard to find; you may have to go directly to the publisher. It is also an alternative to Fernandez and Ashley's book, since about the first quarter of it covers the same material.

The number of aid-books for assembly language programming under CP/M, such as Cortesi's, is finally multiplying! Bruce Brigham's *CP/M Summary Guide for Version 1.4 & 2.0* (1980) gives a handy summary of CP/M commands and programs commonly run under it. It can be ordered from The Rosetta Stone, Box 35, Glastonbury, CT 06025.

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problem since, by the time you have typed in the next command, the LED will have gone out. However, if you must follow with a system reset or with the removal of a disk from the drive, you *must* wait until that drive's light goes off. Otherwise, you may interrupt its reading or writing! The documentation claims that this has been repaired, but this quirk appears to have been carried over from the older release where I first encountered it. However, since Heath's implementation *also* has this quirk, it may be drive dependent.

A third point to note is that MMS recommends *against* sysgening disks for H37 format. The reason is that Heath places a disk format identifier on the boot track at a location occupied by Magnolia's boot routine. Hence, double-density 5-inch disks sysgened with Heath's version will not boot under MMS's version, nor will Magnolia's under Heath's. It's unfortunate that Heath didn't follow Magnolia at this point, since the latter preceded Heath into double-density formats. This appears to be the *only* incompatibility between these two implementations!

Conclusions

Magnolia's implementation of CP/M for the H/Z89 is an excellent one. I have had a few problems with the older version, but those were generally confined to a year and a half ago when I was also having disk drive problems. As soon as I solved those problems (reported in the December 1982 issue of *Microcomputing*), BDOS errors also disappeared.

One advantage to this implementation which I particularly appreciate is that if I should expand disk storage by going to double-sided and/or double-tracked drives, all I would have to do is patch MOVCPM with SETUP and resysgen my disk library. Heath's implementation, as supplied, does not provide this capability. If I decide to go with double-density, it will be a simple matter to link in the appropriate modules after installing the controller. Since the system primitive is also supplied with the operating system, I could do this myself.

The availability of Magnolia's implementation of CP/M has one string attached. The licensing agreement with Digital Research requires that MMS sell CP/M *only* for use with some type of *hardware* from MMS. If you should purchase CP/M with hardware and are concerned about using the latter under HDOS, Dean Gibson of UltiMeth Corporation provides the HDOS support which Magnolia does not supply. He also offers some support for Heath's CP/M implementation.

All in all, I am very happy with Magnolia's version. The system was up and running in short order and will be easy to expand when I choose to do so. Except for the problem noted above with the H37, compatibility with Heath's version is also assured since Magnolia is committed to that. Magnolia Microsystems has certainly done an outstanding job with the newest release of their implementation!

Ordering Information

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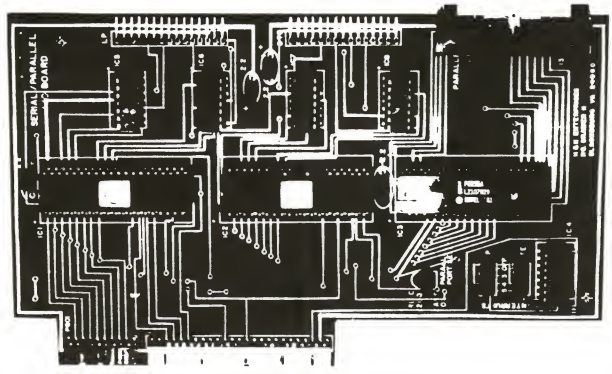

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Heath/Zenith Users in Uniform

Sleep well tonight. Your Heath/Zenith computer is on active duty.

Philip C. Weinberg

"We have people from all walks of life here, and who knows what each of them would like to do with a microcomputer given the chance." If you have seen the movie *Wargames*, the sentence quoted above may give you a slight pause. And if you knew that this statement was made by a First Lieutenant in the U.S. Air Force, you might well agree that it is time for us all to take a closer look at Heath/Zenith microcomputers in the military.

This article comes into being because we have noticed that an unusually large percentage of *Sextant*'s readers are in the military—12%, according to the reader survey conducted for us by McGraw-Hill Research in February 1983. We decided to find out why so many Heath/Zenith users found their way into the armed forces, and what they did when they got there. Over 40 military subscribers responded either to a letter we sent them or to an inquiry in *Buss: The Independent Newsletter of Heath Co. Computers*. The information they provided answered most of our questions.

VA benefits—National Technical Schools

There is a reason for the number of Heath/Zenith users in the armed forces. But we found out that it is not the Heath/Zenith users who have made their way into the military; it is the military that has, in effect, made its way into Heath/Zenith! This has been done through an independent party, the National Technical Schools. NTS offers correspondence courses, including a course in microcomputing. At the end of the course the student has built an H89, and is its proud new owner.

Such a course, at a cost of almost $3,000, would seem to be an expensive undertaking on most military salaries. Until recently, however, the Veterans' Administration system of benefits covered most of the cost. With that in mind, it became very affordable to own a computer. (The GI bill used to reimburse 90% of the cost of the course. Presently, only 55% of the cost is covered. Also, only those veterans and service personnel who were on active duty before January 1, 1977 are eligible for this reimbursement. Correspondence courses are not covered by the new GI bill.)

Scott Douglas, a Staff Sergeant in the Air Force, wrote: "If it wasn't for the GI bill, I wouldn't have this machine now. I got my '89 through a correspondence course (National Technical Schools). It was paid for by the VA using about 9 months of my 45 months of benefits. All told, I have $276 invested" in the computer and the course. He has bought additional equipment, and his total outlay is still "less than $1,500 for the '89, two external disk drives, MPI–99 printer, and Housemaster" home-control system. At these prices, it is not hard to believe that about half of the people who responded to our inquiries mentioned NTS. As another respondent said, "the 90% subsidy for NTS's microcomputing course was too much for many of us to resist."

Price was not the only factor leading these people to Heath/Zenith. Ernest Hood, a Cryptologic Technician in the Naval Security Group, heard of two VA-funded correspondence courses in microcomputers. "I knew the National Radio Institute was offering a similar deal with a TRS–80. I guess I chose the Heath because I had heard of their reputation for excellence from other technicians.... I am truly impressed with the H89. The hardware is well thought out, the documentation nonpareil, and the support fantastic.... Anyone can run an Apple or a TRASH–80 but only those willing to *learn* want a Heath." "The combination of the H89's capabilities and the VA benefits that came about through the school was hard to beat!" explained Alan Gideon, a Lieutenant Commander in the Navy.

The armed forces have always had a very large investment in the newest technologies. Computers are playing a major role in many of the advances

Military to Buy 6,000 Z100s

Zenith Data Systems has signed a contract to supply the Air Force, Navy, and Marine Corps with a minimum of 6,000 Z100s over the next three years. The estimated minimum value of the open-ended contract is $29.3 million. ZDS President Don Moffet told *Sextant* in a telephone interview that it's possible that Zenith will sell the three services as many as 10,000 Z100s over the next three years. Those sales could be worth as much as $50 million.

According to Moffet, the contract requires that if any command in the Air Force, Navy, or Marines wants to buy a single-user, stand-alone microcomputer for office use, it must buy a Z100. In exchange for this exclusivity, Zenith is giving the services discount prices. The individual commands can choose the particular configurations of hardware, software, and peripherals which best suit their needs. Zenith projects that 60% of the Z100s will be equipped with Winchester hard disk drives.

The Air Force, which was the lead service on this contract, requested proposals in March. Thirty-two companies submitted bids, including Zenith and all the other major microcomputer manufacturers. The Z100 was selected after a seven-day final test procedure at the beginning of September. The "exhaustive, extensive" tests were conducted by Air Force personnel from all over the country. "They tested everything possible you could imagine," Moffet told us, "and they did it multiple times." He added, "There were no failures of any kind whatsoever during the tests."

Zenith Data Systems plans to add 300 new employees at its Benton Harbor-St. Joseph, Michigan, manufacturing facility. Moffet concluded our discussion by emphasizing that the Z100 had succeeded in a head-to-head competition with 32 microcomputers. He noted, "This is clearly a major endorsement of the Z100."

currently taking place. They have also become integral parts of much recent equipment. Therefore, in order to maintain a certain competence in their fields, many people in the military must have more than a superficial knowledge of computers. Heath, having long been an educationally minded company, fits in perfectly here. By providing a computer that can be built piece by piece, Heathkit has made itself quite attractive to this group of people who need to know what is happening inside the machinery they are working with.

Economics counts

The Veterans' Administration and National Technical Schools have provided an affordable way to get involved with Heath/Zenith computers, but there is still a problem with money. As more than a few of the respondents noted, military salaries are not high when compared with similar jobs in the civilian sector. This tends to make the price of lots of hardware and software prohibitive.

I must note, however, that *Sextant* subscribers in the military seem to be relatively well paid, according to our reader survey. This indicates a high proportion of officers among *Sextant* subscribers. Their median total personal income before taxes in 1982 was $33,000, as compared to $32,574 for all those surveyed. Their *mean* income was $32,037, about $11,500 lower than the $43,440 mean for all subscribers. By disregarding the few upper income members of the subscriber survey whose presence distorts the picture, one finds these military salaries to be quite comparable with the salaries of *Sextant* subscribers in general.

Even for officers, however, that comparability is lost when we consider total *household* income. *Sextant* subscribers as a whole have a median household income of $40,553. Our military subscribers have a median household income about $4,000 below that ($36,390). Frequent moves and being stationed in remote locations cut down the chances for spouses to provide additional income. (And that last $4,000 in income may be what most families spend on computers.)

Moreover, the difference is even stronger for enlisted people. Enlisted programmers may make half the salary of their civilian counterparts, according to Stan Lockhart, a programmer stationed in Fort Greely, Alaska. H. Mario Toscano, a Chief Petty Officer in the Coast Guard, suggests that since "the military income is somewhat unparallel to the civilian earning rate, Zenith/Heath should make its product more accessible financially to the military community."

One way to make Heath/Zenith products available to the military at more affordable prices might be through the Post Exchange system. Apple and Atari seem to be firmly entrenched there and selling well, but some of the people we have been in touch with feel that there is a demand for a more powerful system which could be met by Heath/Zenith. With the loss of the discounts provided by NTS, Heath/Zenith finds itself at a competitive disadvantage to these other companies in the military market.

Another suggestion is "a military discount, from Heath and from *Buss/Sextant* and *REMark*. For that matter, from all Heath suppliers. More than 5%, less than 25%, typically military discounts are 10%. We could go to the nearest Heath store, if possible, to register and get an ID card or number that could be used when buying either at the store or mail-order. I would be willing to keep all the pertinent records, so as not to burden Heath or other sellers with that chore. When I get my modem built, I would even go on-line to provide this service. If anyone is interested, I am too." That idea comes from Scott Douglas (PSC Box 174, Hanscom AFB, MA 01731).

"If there is one thought I dread, it is that of moving a microcomputer when changing stations. CRTs are not anywhere near as rugged as tanks!"

Going European with the flick of a switch

Life in the armed forces may often involve time stationed overseas. This has some unwanted side effects in terms of bringing a computer to the new station. After considering the problems of moving the computer and its attendant software (a difficulty which will be discussed later) and running all the equipment on a foreign power supply, the prudent computer owner might prefer to stay put.

Part of this problem is made much easier to handle by Heath/Zenith. William Scheppers is a Second Lieutenant in the Air Force, and a Computer Systems Development Officer. He writes, "One feature that Heath tends to build in and other manufacturers seem to totally ignore is the ability to operate most electronic equipment on a variety of voltages and cycles (hertz). It was a very important point to me and probably to most other military people.... Here in Germany, for example, we have 220 volts and 50 hertz. I was able to make the necessary switch within just a few moments because of the foresight of some engineer back at Heath."

Major Charles Chatham of the Bentwaters Heath Users' Group (HUG) in England mentioned a problem his group had been having with flickering displays on their H89s. "Each of us experienced this until one of the members shared with the rest that switch S402 on the terminal logic board has a provision for 50 Hz refresh that eliminates the problem when using European power."

Not all power problems are solved quite so easily. Curtis Ledbetter, a Sergeant Major in the Army, experienced numerous crashes each weekend in Germany. "I determined that the crashes were caused by low line power. On Sunday, the German power is cut back in an energy-saving effort and at times I monitored line power at 80 volts at the transformer.... This problem was also prevalent during the late afternoon and early evening when all the families in my building were using the washers, dryers, and electric stoves, but normally cleared up after the dinner period was over." It is strangely comforting to know that there are some problems which even the best design engineers cannot prevent.

Far, far, away

As noted, life in the armed services may lead to some remote places, making things difficult for the computer user. J. E. Conrad is a Chief in the Navy, stationed in Norfolk, Virginia. He writes of some of the troubles that confront the Heath/Zenith user in the military. "They get sent out on duty where they can't take the computer, get stationed in out of the way places with no nearby service facilities. In my case, because of the hours that I work, I can't take any college courses or attend the local users' group meetings. I have this fancy computer but can't learn how to use it!"

Bob Foos, stationed "in a rural area in the United States ... 60 miles from Kansas City," finds that "there is a problem in not being able to run down to the local computer store and pick up what you need. Most of the purchasing is done by mail order, and most 'window shopping' is done with ads in the different computer magazines."

Mail order shopping can be a frustrating experience. Ernest Hood feels himself "at the whim of the manufacturers' mail-order regulations." Without the option of a local computer store to provide service, military users are forced to rely on the good will and good products of mail order companies. Receiving satisfaction can sometimes be a problem. Charles Chatham reports

UTILITIES

NEW PRODUCT - UD.COM - A printer driver/spooler for CP/M 2.2. Adds universal printing capability to CP/M with unit numbers similar to UD.DVD. Also contains an interrupt driven built-in spooler that queues up to four files with multiple copies and optional titles and page numbering. Time shares your computer so you can print while using the computer for other tasks $39.95

SUPER SYSMOD2—This HDOS enhancement program adds many new features and commands to HDOS 2.0. Included are abbreviated commands (MOUNT SY1: becomes M1 for example) plus commands to: print files, print the disk directory, change the disk label, create batch processed commands, enable the terminal scroll mode, copy files that contain hard read errors and show the free disk space. In addition, the disk directory is alphabetic, file dates remain unchanged when files are copied and a new date switch is added. Also included is a powerful file manager command which presents disk files one at a time and gives a choice from 12 options to perform on the file including changing flags . . . $29.95

SPOOLERS—Softshop drivers are now available with built-in spooling. Get all of the features of UD.DVD, MX.DVD or H25.DVD with a powerful spooler that has a built-in file queue manager which lets you add, delete, restart or abort files, produce multiple copies, pause or stop spooling . . . . . (Each version) $39.95

UD.DVD.—A truly universal device for printers. It will operate with virtually any printer through its settable handshake and format options. Using unit numbers (something like SY0: and SY1: for disk drives), one driver allows you to configure your printer to look like eight printers, each set for different format options. For example, with an H-14 printer, LP0: can be set for 10 CPI with left and right margins, etc. You can even have several printers operating at different baud rates and ports with just one driver. Seventeen options are settable for each of the unit numbers (136 total) and the HELP command will list the setting of each. Requires an H/Z-89 or H-8 with an 8250 UART (H8-4) $29.95

MX.DVD—A driver designed for the MX-80 family printers that offers setable unit numbers and a status help display similar to that of UD.DVD. some of the features include use of control characters to implement the more useful escape sequences, selection of desired handshaking mode and polarity, and a transparency mode for full graphics operation $29.95

H25.DVD.—A driver designed for the H/Z-25 printer which make extensive use of its features. Has the unit number and HELP capabilities of UD.DVD. In addition, control characters can be inserted in text files to produce subscripts, superscripts and double width, underlined and overprinted characters. $29.95

LANGUAGES

DISAS—A fast disassembler program that generates source code suitable as input to the HEATH assembler. Specify HDOS or CP/M $25.00

HFORTH-79—fig FORTH Ver 1.1 modified to include the full FORTH-79 standard plus many other features. HFORTH-79 operates under HDOS and makes full use of the HDOS file structure including named files for both program and data I/O. Additional features include a full screen editor with over 20 commands, and 8080 assembler. Requires an H/Z-89 or an H-8 with an H-19 . . . . . $34.95

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For more details see *Buss* issue #70, page 3.

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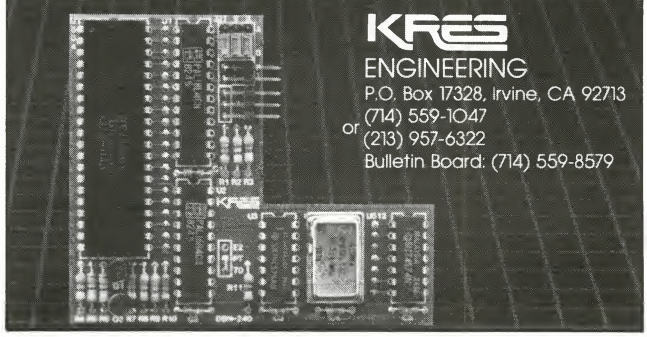

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that "Word-of-mouth advertising has resulted in a number of purchases from companies ... who have shown an interest and responsiveness to our needs."

Moving time

Moving can be one of the most stressful experiences of our lives. For the computer owner this must be doubly so; one slip may not only nullify hours and hours of hard work, it can also be very costly. Mark Kopec is a Private First Class in the Army, stationed in Germany. He remarked, "If there is one thought I dread, it is that of moving a microcomputer when changing stations. CRTs are not anywhere near as rugged as tanks!" Since the military moves its people a lot, Heath/Zenith owners in the services must encounter this difficulty much more frequently than most others. (It is interesting to note that the article in the Summer 1982 issue of *Sextant*, "What to Do with Your H88/89 After the Movers Have Finished Playing Soccer and Dropsy with It" was written by David J. Esche, a Chief Warrant Officer in the Army.)

Alan Gideon says that "The chief disadvantage to owning a microcomputer while in the military is moving it from duty station to duty station. When we moved from the Boston area to D.C., the computer and my two external disk drives were OK, but my modem rattled in its case: a fatal injury. The Navy is not used to handling damage claims for equipment like that yet, so in addition to the normal statements from friends on both ends of the move attesting to the modem I had and its condition at both locations, I also had to indicate its equivalence with other modems which were more readily available in this area, and what the purpose of the modem actually was."

The alternative to taking a chance with a moving company is, of course, to move the system yourself. Many of the respondents chose this option. As Airman First Class Craig Sarty explains, "Whenever I move, the Air Force contracts out my household move." But his H89 is different. "*No one* but me touches my baby." William Scheppers says that software also needs special care during a move. "First, I made a backup copy of every disk. Then I went to a local camera store and purchased a pliable lead foil bag which was designed for protecting undeveloped film as it passes through airport X–ray machines. I put the copies in the lead bag and double-sealed it in plastic bags and then sent it in a separate shipment from the rest of the system. Software is just too hard to replace...."

Some people, however, are not at all fazed by the prospect of moving computers. Frederick Freeland, a Chief Warrant Officer in the Army, sent a letter that could have been titled "Travels with My H8." He and his family, their cat, and the H8/H19/H17 went from Fort Bliss, Washington, to Detroit, on to St. Louis, and finally ended up in the Dallas/Ft. Worth area. The 45-day trip included visits with relatives (as well as the local HUG groups along the way) and was accomplished in his van. Dick Linder also does some travelling with his '89. He writes, "I am a Senior Chief Electronics Technician in the U.S. Navy. I deploy to Antarctica from October through February. Last deployment I took my H89 with an external disk drive to McMurdo station." That's it—no complaints, no horror stories, just a trip to Antarctica with an H89.

"I keep the computer at home when the ship is in port, but move it to the ship while at sea for a week or more."

"Instant users' groups"

Although some of the respondents to our survey found their sheer geographic isolation to be one of the hazards of owning a computer in the military, others were able to derive real benefits from the situation. Charles Chatham, one of the founders of the Bentwaters HUG at the Bentwaters Air Force Base in England, says: "Most of us have learned more about our computers as a result of not having the local Heath/Zenith store just down the street. We have learned to read the instructions v–e–r–y carefully and then to seek help from more experienced members when we fail to find the answers ourselves. We have also learned to share our experiences and benefit from the mistakes and discoveries of the other guy as well. The sense of camaraderie between users is directly proportional to the distance to the local Heath store; or so it seems."

At the other extreme, some military personnel find themselves in a sea of computer knowledge. Donald Wunz is a First Lieutenant in the Air Force. A programmer stationed in Oklahoma, he does not find himself isolated; instead he says "In the military, programmers are concentrated in a few places. ... One finds a vast resource of information available as a programmer. As a result, we are likely to be more informed than the typical computer hobbyist.... There are over 200 people in one building all with some sort of computer background just in the division of which I am part." Even in an out-of-the-way place, military personnel, especially programmers, may find an abundance of computer knowledge at their disposal. (Software people seem to be in a better position here—the electronics technician working on hardware may still find himself very lonely.)

Mark Tollefson obtained his H89 from the National Technical Schools course in conjunction with the benefits that were then offered through the GI bill. He notes, "This put a large number of H89s in the military—instant users' groups." Gorden Golden, a pilot, reports that at the Norton Air Force Base in California they have organized themselves to facilitate group buys of equipment. (That's one way to combat low salaries!)

At home and at work, too

Many of the Heath/Zenith users who responded to our survey indicated that their computers are used both at home and at work. The major home uses mentioned included word processing, games, and spreadsheets, much like any average group of computer enthusiasts. The major applications at work are similar to the home uses, except that programming is much more prevalent, while game-playing falls off the list.

Gene Carnicom's letter reminded us that the United States Public Health Service is also one of the "uniformed services." Mr. Carnicom is a Commander in the United States Public Health Service and a former U.S. Army officer. He is "in charge of a mental health and social service program in the Indian Health Service. Part of this job requires that I keep enough data on services provided and needs established to evaluate my program and to justify keeping my staff on board." He hopes to do much of this record-keeping and evaluation with his new H89.

Heath/Zenith computers also serve in the Reserves. Paul Edwards, a Naval Reservist, has developed his own record-keeping system on his H90. It is "a complete personnel and training information system I developed in COBOL. I received the Navy Achievement Medal for the use of this system in my reserve unit. It provides recall bills, mailing labels, rosters, and various management reports."

Working with an engineer in a geophysics lab that has developed a unique Dual Doppler Radar, Scott Douglas has "been helping to design and build a microprocessor-based network to monitor and control this radar." He has used his '89 to do part of the job. "The memory test routines, checksum routines, several comm routines, and some of the real-time control routines were written right here at the '89 keys, as well as debugged. I would simply take the hardcopy to work, enter it, re-assemble and go. Talk about impressions! My engineer loved it...."

A Lieutenant in the Naval Medical Service Corps, Mike Saunders has

eleven Z90s and one Z100 under his command. He also has an H89 at home. "Quite often I am required to take work home. It may be technical or administrative in nature. It is very convenient for me to work at home using the word processor, electronic spreadsheet, or one of the compilers and when finished I dial up a Z90 at work which is set up as a secure RCPM system and transfer my work in before I go to bed knowing that it will be there when I arrive the next day." As Mario Toscano says, "The taxpayer is the greatest beneficiary of a military person (and I venture to say any civil servant) owning a home computer; he or she will use it to do some work at home, inevitably!"

Some people even keep their computer at work. Wayne Linschied, an Electronic Technician in the Navy, owns an H8/H9. "I keep the computer at home when the ship is in port, but move it to the ship while at sea for a week or more." The computer aids "in processing administrative chores and ... is used for games, letter and message writing, and for keeping track of the location and calibration status on over 200 pieces of electronic test equipment." Chief Warrant Officer David Mann of the Army has his H89 at the office "doing all unclassified correspondence and other military paperwork.... This is not charity but necessity since my issued IBM Selectric built in 1971 finally died and went to the disposal yard. No replacement typewriters are available here 'cause old Uncle Sugar is out of money. So, it's either handwriting with a number 2 pencil or the H89."

Joe Richter, an E–6 in the Navy, says "What I have learned in the military has helped me to better understand my computer, which in turn helps me to better understand the one I work on for the Navy." This seems to be true in many instances. Heath/Zenith computers are found throughout the military in many different situations. (Karl Prinsen takes his aboard the *U.S.S. Enterprise*—"Yes, I was there when we got stuck in the mud.")

Frederick Freeland concludes, "As you can see, my computer has seen a lot of action on a good number of fronts and is likely to see a lot more."

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HUGCON 2—Twice as Good

Once again, the National HUG Conference probed Heath/Zenith company policies, showcased support from independent suppliers, and gave users a chance to meet and learn from each other.

Frederick Zimmerman

At the Second National Heath Users' Group Conference (HUGCON 2)—held at the Hyatt Regency O'Hare just outside Chicago over the weekend of August 19-21—Heath/Zenith reaffirmed its commitment to its user community; independent hardware and software vendors released important new products, demonstrating their continued confidence in the future of the Heath/Zenith market; and a Heath/Zenith Academic Users' Group was formed, highlighting Zenith's recent successes in selling Z100s to colleges and universities.

The ties that bind

HUGCON 2 also demonstrated again that Heath/Zenith has an unusually knowledgeable and dedicated user community. Paid attendance was 1,386, and there were another 150 to 200 "walkthroughs." In the exhibition hall, the relations between users and vendors were relaxed and friendly; there was very little demarcation between "customers" and "colleagues." This was appropriate, since (as at HUGCON 1) most of the vendors were long-time members of the user community.

A similarly friendly atmosphere prevailed in the relations between Zenith Data Systems (ZDS) and the various local users' groups. Dr. Herb Friedman of the Pomona Heath Users' Group was asked to give an address on how to organize a successful local users' group. If I may paraphrase, his argument was that the success of a group depends on preventing the formation of a clique of advanced users; such cliques make novices feel that they don't have enough to contribute. Friedman suggested that the more technically sophisticated members of the group should sublimate their technocratic urges by sharing their knowledge through education. This, indeed, was the approach the national HUG took in organizing the program for HUGCON 2. Experts from all parts of the Heath/Zenith community—vendors, users, and ZDS personnel—led seminars and discussion groups all day Saturday and all Sunday morning. These informative sessions were further evidence of Heath/Zenith's desire to maintain amicable, supportive relations with its user community.

Friday evening, Bob Ellerton presented four awards in recognition of "outstanding contributions to the Heath/Zenith user community." The first went to Pat Swayne, software engineer for the Heath Users' Group, a prolific software author, and a frequent contributor to HUG's official publication, *REMark*. The second award went to Tom Jorgenson of Software Wizardry. Introducing Jorgenson, Ellerton said, "there are many fine vendors in this room; but I don't think there's *anyone* right now who can measure up to the standard of support this gentleman has given our community." The third award went to the Capital Heath Users' Group of Washington, D.C., for organizing the first regional users' group conference, CHUGCON 82. (*Sextant* #9 will have a report on CHUGCON 83.) Before presenting the final award, Ellerton said: "Tomorrow, I'm going to be 34 years old: August 20, 1949. This individual built his first Heathkit in that same year." Larry Sites of Alexandria, Virginia, received a lifetime membership in the Heath Users' Group "for his outstanding support of the Heathkit name."

This is a good place to note that the family members of HUG personnel made some outstanding contributions to the success of the conference. HUG wives Jill Ellerton, Teresa Jensen, Mary Gillespie, and Laura Swaine all volunteered their assistance, as did Margaret Bacon's daughter Kris. Bob Ellerton said that perhaps the most outstanding help came from the Gillespie boys, Kurt, John, and Chris. He told *Sextant*, "They really did a good job for us."

"When the hell are you guys going to do some advertising?"

Friday evening's opening speaker, Pat McNamara—director of marketing communications for ZDS—posed that familiar question, then did his best to answer it. McNamara explained to a skeptical audience that Zenith bases its advertising strategy on a concept called "positioning." As I understand it, this means that Zenith

Photo by Charles Floto

Pat Swayne (right), HUG's software engineer, was given an award for his outstanding service to Heath/Zenith users. Pat's short associate from Heath/Zenith Educational Systems (center) has also benefitted from his expertise. (See *REMark* #40, May 1983, "Teaching HERO a Thing or Two.")

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is trying to establish a strong, unique identity in the minds of potential customers. Having done a study of its strengths and weaknesses vis-a-vis the competition, Zenith believes that it should emphasize a reputation for ease of use. I suspect that Zenith wishes to take advantage of the fact that—unlike many of its competitors (e.g. IBM)—Zenith Radio Corporation already has a reputation for manufacturing products which are easy to use. After all, what product could be "friendlier" than a television?

Zenith has been using the cartoon character Ziggy to illustrate its "friendly" posture to the readers of business periodicals such as *Forbes*, *Fortune*, *Inc.*, and *Business Week*. McNamara was satisfied that the "Ziggy for Zenith" aspect of their print media campaign is doing a good job of establishing Zenith's "friendliness" theme in the minds of its target audience. He did seem to recognize, though, that many Heath/Zenith users would *really* like a mass media advertising campaign aimed at increasing Zenith Data Systems' name recognition among the general public. McNamara pointed out that there are a number of microcomputer companies (Atari, Osborne, Victor, Eagle) which have had huge ad budgets, flashy campaigns, and very high sales—and which have then found themselves in grave financial difficulties. These examples should be sufficient grounds to justify a certain caution about the potential risks of a big TV advertising campaign.

Of course, a TV campaign might also have potential benefits, such as letting the general public know that Zenith sells computers. One of the high points of HUGCON 2 came when McNamara dimmed the lights in the meeting hall and showed a Zenith "corporate spot," a forthcoming Zenith Radio Corporation advertisement featuring Zenith's new "smart" television *and* ... a Z100! To judge by the applause which followed, showing this spot went a considerable way towards dispelling the HUGCON audience's unhappiness with Zenith's lack of advertising exposure. Overall, McNamara seemed to do a good job of reassuring people that, even if they don't agree with Zenith's advertising strategy on the grounds that it is misguided or insufficiently aggressive, the company does at least take the issue seriously.

The friendliness goes in before the name goes on?

Personally, I have some doubts about the wisdom of choosing "friendliness" and ease of use as the theme of the Zenith computer advertising campaign. For one thing, it seems that Heath/Zenith has a more firmly established reputation for quality, reliability, and good documentation. Moreover, soldering irons aren't what most people think of as "ease of use." In order to push "friendliness" to non-technical people, Zenith has to refrain from taking advantage of all the good karma the Heathkit name has among technically minded consumers.

Furthermore, "ease of use" is a goal which is sometimes in tension with "quality" and "reliability." The rush to get a new and improved software product on the market can lead to insufficient quality control. That is precisely the reason why Zenith Data Systems has historically been rather cautious about releasing new versions of operating systems and whatnot. At HUGCON 2, several ZDS software experts went out of their way to mention that they thought IBM released its version of MS–DOS 2.0 much too early. And Zenith Data Systems simply doesn't have the resources to be assured that it will always be on the true cutting edge of software ease-of-use. Rich companies like Apple can afford to invest in the research and development which creates products like the Lisa; companies like IBM can use their financial muscle to get first access to programs like VisiCorp's VisiOn or Microsoft's MultiTool Word. Hence, the "friendliness" ad campaign may eventually put Zenith in the position of touting a product characteristic in which it does not have a strong competitive advantage.

I, for one, think Zenith Data Systems would be better off stressing its reputation for high-quality engineering. This is the characteristic which is responsible for the company's most impressive successes in recent months. Zenith has arranged quantity sales of Z100s to such technically sophisticated organizations as the microcomputer users' groups at aerospace corporations Martin Marietta and Boeing, as well as the state university systems of Kansas, Vermont, and Michigan. These organizations don't care much about "friendliness"; but they do care a great deal about the technical quality of their computers. And that is where the Z100 shines: with its 8085 and 8088 dual central processor units (CPUs), CP/M and MS–DOS operating systems, 225 x 640 pixel color graphics, and an S100 bus, the Z100 is a superior value.

Another strength Heath/Zenith has with technically sophisticated users is its reputation for good documentation (in the tradition of the Heathkit construction manuals) and for relative openness about technical information. The Heath Company, for example, has sold copies of the source code of its proprietary Heath Disk Operating System, HDOS, which runs on the H8 and H/Z89.

This strength showed itself at HUGCON 2, where Zenith Data Systems made its technical experts avail-

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able to take part in a series of discussion groups. Brian Barnes of the operating systems group spoke on version 2.0 of the Zenith Disk Operating System (Z–DOS), and Bill Zurney, a colleague, answered technical questions about CP/M–86. (Since Z–DOS and CP/M are products licensed from Microsoft and Digital Research, respectively, Zenith cannot make the source code available.) Dave Perkins, another ZDS engineer, talked a bit about the Z100's interlace mode, which should allow for at least 640 x 400 pixel video resolution. In addition to these formal presentations, there were numerous informal opportunities to talk with jeans-clad Zenith engineers. This relatively fluid environment for the dissemination of information may help to distinguish Heath/Zenith from the secretive blue pinstriped corporate culture of competitors such as IBM.

(However, there was one moderately disturbing note at HUGCON 2: the question-and-answer sessions didn't quite come up to the highly informative standard set by HUGCON 1. The primary reason for this change was that Barry Watzman resigned from ZDS early this summer. [For details, see *Sextant* #7 or issue #70 of *Buss: The Independent Newsletter of Heath Co. Computers*.] The former computer product line manager for Heath/Zenith combined an unusual depth of knowledge about all phases of his company's computer activities with an unusual candor in his responses to inquiries from users.)

Tangible friendliness

The rallying cry at last year's HUGCON 1 was "Where's HDOS 3.0?" Time after time, company officials told the frustrated audience: "We're not permitted to talk about future products."

Almost exactly a year later, Bill Johnson, president of the Heath Company, announced at Saturday evening's HUGCON 2 keynote dinner: "The project is active. The project is also funded. You will see HDOS 3.0." He warned that this will be the last new release of HDOS, but promised that it will be "very slick."

The top management of Zenith's computer operations concluded the evening by making another (extremely tangible) signal of their continuing commitment to the user community. Bill Johnson, president of the Heath Company, Joe Schulte, president of Veritechnology Electronics Corporation (which owns the Heathkit Electronic Centers), and Don Moffet, president of Zenith Data Systems, presented three very generous door prizes. Bob Crowley of Parma, Ohio, won a HERO I robot, presented by Bill Johnson; Glenn C. Davison of Oconomowoc, Wisconsin, won an H110 kit, presented by Joe Schulte; and Ronald C. Armstrong of Waukesha, Wisconsin, won a ZW120, the Winchester drive version of the Z100.

Vendors show confidence

Last year, there were 22 independent hardware and software vendors at HUGCON 1; this year, there were at least 40. The overall trends in the exhibition area seemed to be positive. For example, vendors introduced a number of products for the year-old Z100. Most impressive, though, was a new product from D–G Electronic Developments Co., which introduced an entirely new H/Z89-compatible *computer*, the Heartbeat. That's strong testimony that vendors are confident about the future of the entire Heath/Zenith computer community.

Photo by Elizabeth Saxon

HUG singled out Tom Jorgenson (left) of Software Wizardry as a vendor who has provided outstanding support to the Heath/Zenith community.

In essence, D–G created the new computer by putting their Super 89 board into a box along with a power supply. It is in many ways a substantial improvement over the H/Z89. All Heartbeat configurations offer 4 MHz operation of the Z80 CPU; 128 kilobytes of random-access memory (RAM), expandable to 256K; a real-time clock/calendar with battery backup; and an electronic "ghost disk" which uses some of the Heartbeat's large RAM capacity to emulate a floppy disk, greatly increasing the speed of operation of programs which require disk access.

The Heartbeat offers a variety of different configurations of disk storage capacity and cost. According to D–G, it can "use all existing Heath/Zenith H89/Z90 software and hardware products." "We feel there's an ongoing market for an '89-type computer," said Bruce Denton of D–G, who seems to share the widespread belief that Heath/Zenith will stop producing '89s someday soon.

In a parallel development, Trionyx Electronics, Inc., announced about two weeks before HUGCON 2 that it intended to continue production of the H8, Heath's original computer. (Trionyx didn't have a booth at HUGCON 2; president Bill Perry, who came to Chicago to look around, told us that Trionyx was just too busy to prepare an exhibit.) In issue #73 of *Buss*, Trionyx said: "The Heath Company is aware of our plans and has greatly encouraged our work in continuing with the H8 computer. The Heath Company is providing us with the assistance required to make this effort a success." Trionyx noted, "It should be fully understood, however, that this effort is entirely our own and that the Heath Company is not directly involved. The Heath Company will assume no liability of any kind for this project." Despite this disclaimer, it is clear that Zenith, far from discouraging D–G and Trionyx as "poachers," has recognized that the continued expansion of the H8- and H/Z89-compatible community can only benefit the reputation of Heath/Zenith computers.

Vendors showed new products for the H/Z100, and for Zenith's latest terminal, the H/Z29. Sunflower Software introduced an arcade-style game called Z-BERT, the first game I've seen which fully utilizes the Z100's color capacities; Cleveland Codonics had several Z29s showing off the high-resolution graphics capabilities of their Imaginator 2 graphics board; Software Wizardry introduced a color graphics program called PALETTE, with light-pen interface; Software Wizardry distributed for the first time the CP/M–85 version of ZLYNK II; and

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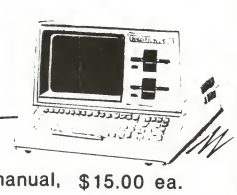

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Steve Robbins was there to sell WatchWord, his new Z–DOS word processor.

Several seminars gave vendors an opportunity to share technical expertise with their fellow Heath/Zenith users. Dale Lamm of Software Wizardry gave a presentation on "Communications/Modems"; Bruce Denton of D–G talked about "H8/H89 hardware"; and user Dennis Hamilton chaired a CP/M panel which included vendors Bill Parrott (affiliated with Software Wizardry), Al Dallas (Software Magic), Ray Livingston (Livingston Logic Labs), and Dean Gibson (UltiMeth), as well as Bob Mathias, author of the CPS modem program. (As I noted earlier, there's often a very fine line between "user" and "vendor"; most of the vendors on this panel could accurately be described as prominent users who happen to have a business going on the side.) Most of the seminars drew near-capacity attendance. Such a thirst for technical information is a good sign for the future of the market for third-party hardware and software products.

Heath/Zenith finds a niche in academia

Sunday morning's seminar on Academic Computer Uses was moderated by Arthur Seebach of St. Olaf College. There was an enthusiastic discussion, and everyone present expressed a desire to keep in touch, so Michael Lougee of the University of Michigan's Institute for Social Research passed around a notebook for names and addresses. Within an hour or two after the meeting, a list of 64 names had been typed onto disk, printed out, and distributed. If you are interested in joining, you can contact Dr. Michael Lougee, Heath/Zenith Academic Users' Group, Center for Political Studies, University of Michigan, Room 4253A, 426 Thompson, Ann Arbor, MI 48106.

The strong attendance at the Sunday morning session reflects Zenith's considerable success in selling to the academic marketplace. Zenith's Z100 has been selected by a number of colleges, universities, and state school systems, including: Elmhurst College, Illinois; the University of New Orleans; the Vermont State Colleges; Tufts University; the University of Wisconsin at Madison; the Kansas State Board of Regents, which represents all Kansas state colleges; the Michigan Association of Colleges and Universities, which represents the University of Michigan and 12 other state universities; and Clarkson College of Potsdam, New York, where every member of the freshman class has been issued a Z100. (St. Olaf College, mentioned above, has an installed base of over 50 H89s. For further information about St. Olaf, see Lynn Steen's article in this issue.) Clearly, Zenith has established a significant foothold in the academic market.

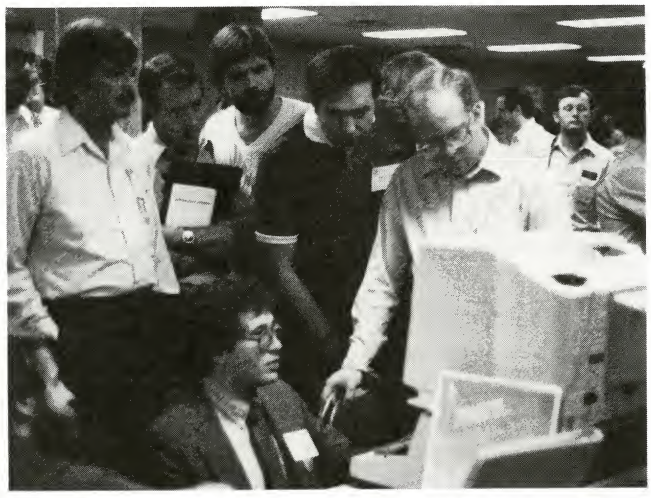

Photo by Elizabeth Saxon

Dave Perkins (center, at terminal) was the resident ZDS expert on the Z100's interlace mode—which can potentially double graphics resolution. After giving a seminar on the subject, he and a number of his listeners reconvened in front of a vendor's Z100 for a demonstration.

There are several reasons why this new market niche may be very beneficial to the future of the Heath/Zenith community. First, academic institutions tend to reverse decisions slowly if at all; the universities that have begun to buy Z100s in quantity will very likely continue to buy Z100s for several years down the road. This will provide Zenith with a steady flow of business, and should help to extend the production lifetime of the Z100. Second, academic institutions will, by nature, train new microcomputer users. Many students and professors will get their first sustained exposure to microcomputing on a Z100. (For example, the Institute of Social Research at the University of Michigan, which has been buying Z100s, is a national center for training social scientists in quantitative research methodology.) Third, colleges and universities tend to have lots of technically sophisticated users. Some of these people will begin adding to the independent software and hardware base for the Z100.

All these developments should certainly enhance the quality of life for other Z100 users. Moreover, Heath/Zenith's enthusiasm for its activity in the computer business may depend in part on the well-being of the Z100. Hence, Zenith's emerging stronghold in the academic market niche is good news for the entire Heath/Zenith computer community.

A good omen

For the most part, conference attendees seemed to think that the conference went very well. (One exception: two people who attended Saturday morning's "Introduction to Computing" reported that the presentation was patronizing and virtually useless.) Several HUGgies said that they thought HUGCON 2 was "twice as good" as HUGCON 1. It's easy to see why they thought so: the exhibition hall was substantially larger, and the vendor displays in general were bigger, slicker, and more professional.

National HUG manager Bob Ellerton said he was pleased with this year's conference: "it was pretty smooth compared to what I went through" at HUGCON 1. He said that the comments he received from Zenith management were "even more positive than last year." He particularly noted that ZDS Director of Marketing Communications Pat McNamara "was impressed as all get-out" by the enthusiasm and energy of the Heath/Zenith user community.

Ellerton told *Sextant* that, although HUG hadn't yet decided on a specific hotel, next year's conference will very probably be held somewhere in the Chicago area. At the end of last year's HUGCON 1, Ellerton and company were very optimistic that there would be a HUGCON 2. Note the significant difference: at the end of this year's HUGCON 2, there is no doubt at all that there will be a HUGCON 3. The National Heath Users' Group Conference is becoming a tradition—and *that* is a good omen.

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Getting into Z-DOS Assembly Language—Quietly

Disabling the H/Z100's key-click feature is just one of the things made easier by using assembly language.

D. C. Shoemaker

Now that you've got your brand-new H/Z100 computer, have you thought about programming in assembly language on it? The '100 gives you two central processor units (CPUs), the 8-bit 8085 chip and the 16-bit 8088 (both from Intel). You may have heard some debate about how easy or hard it is to program on one or the other; but I think that even the beginner can start to use assembly language on the '100. (And if you, like me, don't care for the '100's key click, you can start into assembly language and get a quiet keyboard at the same time.)

In some quarters, of course, assembly language has acquired the image of being esoteric and hard to learn—something only full-time professionals should touch. Better to stick with the good old BASIC that we all know how to use. Or maybe move up to a structured language like Pascal that will teach us good thinking habits.

There's a certain amount of truth to both those ideas. However, I think you'll find that any language should be judged, not in terms of its image, but in terms of the jobs it will do—or the jobs it will let you do better than the others. And there are certain jobs that assembly language shines at.

In the real world of applied computer programming, there are really only two considerations: do you require a quick answer to a one-time question? Or do you need to develop a "permanent" software solution that you will use repeatedly? If the former is true, then BASIC is generally the best choice. If the latter, then, again, you have two choices.

First, you can use a higher-level language such as Pascal to do a first-class professional job in a language that's portable, easily structured, and reasonably fast. However, if the program isn't too large or if the program needs to execute more quickly than a program in BASIC or Pascal, then assembly language is your best bet. It is fast and it uses up less memory than the higher-level languages.

Before you pale at the prospect of writing assembly-language programs for your computer, pause to think that most of the programs you routinely run were written in that language and, like any other, assembly language is actually learnable, given time and application. The main requirements are a desire to learn and the chance to get some practice.

Assembly language's reputation for difficulty may be tied up with its virtues: assembly language is a close cousin to the ones and zeroes, the binary instructions, that are the computer's native tongue. When you run a program in BASIC, you have to have the BASIC interpreter sitting there in memory to translate your English-like instructions into something the computer can handle. That takes a large program doing a large amount of work. It uses up both time and memory. Because assembly language is closer to machine language, the program will get its job done more quickly. (Moreover, it won't need a large program like BASIC running alongside it and using up space in memory. In the form in which you run it, it will already be in ones and zeroes that the computer can execute directly.)

But although assembly language is "close" to the ones and zeroes the computer accepts, it has three important differences.

First, as you write an assembly-language program, it is a "symbolic" representation of computer instructions. Those strings of ones and zeroes will be called by mnemonics, names whose meanings are relatively memorable and understandable. "JMP" or "ADD" are as easy to learn about as BASIC's "GOTO" or plus sign (+). You will write your program, your source code, much as you do in BASIC. You then run it through the assembler program. The assembler will produce (will "assemble") object code in binary—much as your BASIC interpreter produces it. (The difference is that the assembler can provide it to you in the form of a .COM file. That is, you have a program that can be run on its own, instead of having to rely on BASIC, or some other language, every time you want to run it.)

Next, unlike someone working in machine language directly, the assembly-language programmer doesn't have to worry about keeping track of absolute memory locations. The assembler will decide what data will be stored at what addresses. You are thereby spared nearly endless opportunities for making mistakes. (And the assembler will give you its own error-checking help on your program, so your potential for error is no worse than in any other language.)

Finally, assembly language is able to take advantage of standardized functions of your operating system. The operating system will provide you with a number of "hooks" on which you can hang some jobs that would be a nuisance to do yourself. These functions, or system calls (SYSCALLS), will differ depending on whether you're using the Zenith Disk Operating System (Z-DOS) on the '100's 16-bit side, or Digital Research's CP/M operating system on its 8-bit side. In either case, they save you work.

But enough of reassurance. Using assembly language may actually be easier than talking about it. My theory of learning computer languages probably gives computer science professors nightmares, but I've found that the

```
10 PRINT CHR$(27);"x2"   ' Send escape command to computer
20 SYSTEM                ' Return to CP/M via warm boot
```

Listing 1. Defeating the key click in Z-BASIC.

```
                                TITLE   QUIET.COM       ;A program to reset the H/Z100
                                                        ;key-click feature to off.
                                PAGE    ,132            ;Set .LST width to 132 characters.
                                .XLIST                  ;Don't list INCLUDE files.
                                INCLUDE DEFASCII.ASM            ;Useful definitions that we
                                INCLUDE DEFMS.ASM               ;can use.
                                .LIST                   ;Turn list on again.

0000                            PGMSEG  SEGMENT                 ;What memory segments to be used.

                                ASSUME  CS:PGMSEG,SS:PGMSEG,DS:PGMSEG,ES:NOTHING

0100                            ORG     100H            ;Starting memory location of program.

0100                            START:
0100  BA 0109 R                 MOV     DX,OFFSET MESG  ;Get address of control string.
0103  B4 09                     MOV     AH,DOSF_OUTSTR  ;Get function to output text.
0105  CD 21                     INT     DOSI_FUNC       ;Print the control string.

0107  CD 20                     INT     DOSI_TERM       ;Terminate program.

0109  1B 78 32 24               MESG    DB      CC_ESC,'x2','$' ;Control string to kill key click.

010D                            PGMSEG  ENDS
                                END     START
```

Listing 2. The 8088 assembly-language program to turn off the key-click feature when running under Z-DOS. The shaded portion on the left is taken from the source listing, QUIET.LST, which can be produced by MASM in the assembly process. The .LST file gives the hexadecimal instructions that represent the mnemonic instructions contained in the .ASM file. Additionally, the .LST file gives the hex equivalents of the symbols used in Z-DOS assembly-language programming.

hands-on approach works best. If you have an H/Z100 computer, follow along and give assembly language a try. We'll take a look at everything you have to do and know to write your first program. And when you're done you'll have a program in your library that will do something useful and that you can modify to suit future needs.

Before we start, remember that it's impossible to hurt the computer when you're writing software. (Unless frustration drives you to pick it up and throw it against the wall.) The worst thing that can happen is that the system will crash or hang up somewhere, and you'll have to reboot and begin again. In rare cases, you can inadvertently tell the operating system to overwrite something on the disk—which is one excellent reason for keeping back-up copies of your valuable software. With that in mind, let's begin.

Getting started

The H/Z100 computer is a thoroughly modern computer. Unlike the older H8, there's no front panel the user can use to "talk" directly to the central processor unit (CPU). Unlike the H/Z89 and '90, there is no OFF-LINE key to allow the user to send something directly from the keyboard to the terminal without going through the computer.

The H/Z100 is a true software-controlled machine, with which the user can communicate only via software. This is the underlying reason for the extreme versatility and capability of the computer. But it can also create difficulties for the first-time user who may not be prepared to take advantage of the H/Z100's power and sophistication. These notes should help you overcome some of those difficulties by leading you through the basics of writing an assembly language program under both of the operating systems offered by Heath/Zenith.

I recently finished building an H120 kit, with which I'm particularly pleased. It's my third Heath computer kit (following an H8 and an H89), and without a doubt the finest effort yet from Heath. As with all things, however, there is always at least one thing about any computer that misses the ideal; and in my case it's that key-click feature that's built into the system. I have it on authority from Bob Harris, technical consultant with Heath, that there's no way to defeat the click from the keyboard itself, since it lacks the "OFF-LINE" key present on the H19 and the H89. This means that you can only turn off the key click by telling the computer to do it for you. According to the H100 operator's manual, the key-click feature can be turned off by transmitting an ESCape x2 command to the computer.

The first way I thought of to disable the key click was to write a short program—such as the one in Listing 1—that would send out the required escape code. This worked fine, but had the drawback of taking several seconds to load BASIC, then load the program and run it, and then return to the operating system. Clearly not a procedure you'd want to go through very many times. This led me to do a bit of research into what else I had available to me.

In reviewing the manuals that came with the '100, I found that both Z-DOS and CP/M allow you to identify a program (a .COM file) that you want the operating system to run every time you boot the system from power-on. The .COM file can be anything you want. So it occurred to me that if I had a small assembly-language program that sent the proper control code to the computer, my problem with the key click would be solved.

First I took a look at CP/M-85. I'd worked with CP/M before, and familiarity breeds content, as some say. Also, the work required to program in 16-bit 8088 assembly language seemed formidable at the start. So I began with the 8-bit side of the computer, the 8085. Since the 8085 is just an updated version of Intel's old standby, the 8080 used in the H8, it seemed like a good place to start. (For those who are interested in the CP/M approach, I have an article on it in the October 1983 issue of *REMark*.)

Of course, doing the same thing on the 16-bit side, under Z-DOS, requires a different program—one written in 8088 assembly language.

Z-DOS and the 8088

There have been a lot of unfavorable things said about how difficult 8086 and 8088 assembly language is to write; and

given the magnitude of improvement in capabilities over earlier chips, that's not hard to understand. However, it's not all that bad, as I hope the following example will show. Remember, as with the 8085 example above, this is intended as more of an "ice-breaker" than a complete tutorial, and there are probably better ways to do what we're about to do here. With that in mind, on to the 8088 and Z–DOS.

First, another quick look at the manuals. When my H120 arrived, it took me quite a while to work my way through the thousand or so pages of documentation that accompanied the system. When I finally reached Appendix P of Volume II of the Z–DOS reference manual, I found something of great usefulness. The whole of Appendix P (five pages, but not to worry, that's enough) is devoted to "Notes on Writing Z–DOS Programs." Just what we need.

There are two basic approaches to writing 8088 code. One produces what Microsoft and Heath/Zenith call executable programs or code (.EXE files). The other produces the more common .COM files. The main difference is that .EXE files require 512 bytes more memory, but can access more main memory directly, while .COM files are shorter but restricted to the first 64K of main memory. In the case of our short program, this is of no real importance, so for our purposes, we'll work with the latter. All you need note for now is that there is a difference in programming techniques for the two file types. Appendix P makes that more clear.

If you look at the program listed on page P.5 of the manual, you'll see an example program (EXAM2.COM) that will assemble into a .COM file. This is the one we'll use as the basis of our program. For those of you who don't have a manual handy, Listing 2 shows the program as modifed for our use here. Refer to that as we look at what's going on.

My theory of learning computer languages probably gives computer science professors nightmares, but I've found that the hands-on approach works best.

The Z–DOS program

First, in looking at Listing 2, note the PAGE ,132 statement. This is what's called a pseudo-instruction. It's not a "real" 8088 statement, one that the 8088 will execute directly (hence the term "pseudo"). Instead, it causes MASM to create a listing of the program that's 132 columns wide. This statement is helpful in tailoring the listing to your printer's characteristics. If you have an H14 or an MX–80 printer, you should change this to PAGE,80 or leave it out altogether. (The default width is 80 characters.) The comma after the word PAGE means that we've left out the length-of-page specification. The default length is 50 lines.

The next thing to notice is the INCLUDE statement. This is how we refer to other files that contain useful pieces of code that we can use without having to retype them each time. Aside from the time wasted in retyping commonly used code, there's all too great a risk of introducing errors. Also, by using such common blocks of code, we can shorten the program in listings like the one we're using here; it's not necessary to list the INCLUDEd code, since it's already on your Z–DOS distribution disk. In our example, we have two INCLUDE files: DEFASCII.ASM and DEFMS.ASM. DEF is a name convention that tells you that the file is a set of definitions, rather than a block of code that performs some action. DEFASCII.ASM contains the code EQUates or equivalences of the ASCII characters we'll want to use in all sorts of programs. This saves us having to set up EQU

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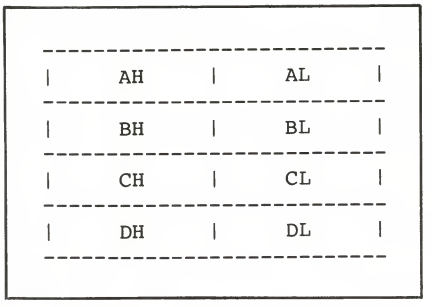

Figure 1. The 8088 general registers.

statements in each program we write.

DEFMS.ASM contains the most commonly used "hooks" or features of the operating system, Z–DOS, itself. For example, we don't have to insert code calling for an output routine to communicate with the CRT. It's a little like the use of the SYSCALLs, or function calls, in CP/M, but more sophisticated.

The next part of the program reveals the greatest difference between the 8085 and the 8088. The 8088 can address vastly more memory than the 8085 can, and it must have some way of managing all that memory. Program segments (PGMSEG) are one way to do this.

A short digression to examine the architecture or structure of the 8088 might be useful at this point. The 8088 includes a memory register for each segment. There's a code segment, a data segment, a stack segment, and an extra segment.

The ASSUME assembler directive in our program tells the assembler that it can plan to use the code segment, the data segment, and the stack segment, but that we don't intend to use the extra segment. This is a memory directive, and is used to organize the computer memory. For more on assembler directives, see page 10.90 in the Z–DOS reference manual. For now, just type it in as shown.

The ORG statement tells the assembler where to locate the starting point for the generated code. In this case, it's to be started (ORiGinated) at memory location 100 hex, or 256 decimal. This is the normal starting location for user programs like this one.

START: is another assembler directive. It tells the assembler that the code to be generated starts here, at the real starting point of the code. Our program STARTS with two MOV instructions which tell the computer to MOVe something into one of the CPU registers. In our example, it's telling the computer first to MOVe the address of the control string we want printed into register DX, and then to MOVe one of Z–DOS's function calls (DOS_OUTSTR) into register AH.

Figure 1 may help make this a bit clearer. It shows the layout of the general registers the 8088 uses to keep track of data and instructions and addresses. AH and AL stand for the high and low byte of the A register, respectively.

That first MOV statement loads into the DX register (DH and DL, together) the two-byte address of the memory location in which the program stored the control string we want to send to the computer. The control string itself doesn't move anywhere.

Then, the next MOV takes the function number of DOS_OUTSTR and moves it into the AH register. DOS_OUTSTR is the Z–DOS routine that prints data at the terminal. This is very much like a CP/M system call (SYSCALL) or function call in that it represents a frequently used subroutine that we don't have to invent and write out each time we want to send something to the terminal. Next, the INTerrupt command tells the computer to execute the DOS_OUTSTR function. Finally, the last INTerrupt command terminates the program by returning to Z–DOS.

Next comes the actual message we want to send to the computer. This is the control string ESCape x2 that we need to send to the terminal to turn off the key click. The "CC_ESC" is the assembly language expression for the ESCape character, and the "x2" is the remainder of the string we need. The "$" tells the assembler that this is the end of the string.

Finally, there are two lines to tell the assembler that this is the end of the PROGRAM SEGment and the end of the program.

Note that we used the character-string output to the console. This is a more efficient approach than sending one character at a time, especially in 8088 code.

Now we're ready to get to work. First, type in the program just as it appears in Listing 2. You can use the editor that comes with Z–DOS, or any other you may have available. After typing the program, save it to your disk under the name QUIET.ASM. (Again, you could use any name, but this one made sense to me.)

Assembling the Z–DOS program

With the program saved to disk, we're ready to assemble it. Here are the steps you need to take. First, call the assembler by typing the command:

```
MASM QUIET
```

After a certain amount of disk work, you should see a message on your screen that looks like Figure 2. If you get an error message, it means you typed the program incorrectly. Call the editor, review the program and locate the problem, correct it and resave the program on the disk, and reassemble.

Next, we have to LINK the object code produced by the assembler. Since the object code produced by MASM is relocatable, the LINK process resolves all the memory location references and "fixes" the program to run in a certain location. Here's where those segment registers are important. To LINK the object file, type the following command:

```
LINK QUIET
```

Notice the output from LINK, in Figure 3. It tells us that we have an error resulting from the fact that we used the stack definition in the ASSUME directive,

```
The Microsoft MACRO Assembler
Version 1.07, Copyright (C) Microsoft Inc. 1981,82

Object filename [QUIET.OBJ]:    <return>
Source listing  [NUL.LST]:      <return>
Cross reference [NUL.CRF]:      <return>

Warning Severe
Errors  Errors
0       0
```

Figure 2. Screen output from MASM. Note that we just pressed the RETURN key in response to the assembler's questions. With the "NUL" as the default, no file is created. We could have given real names to the .LST and .CRF files, thereby creating those files on the disk.

```
   Microsoft Object Linker V1.10
(C) Copyright 1981 by Microsoft, Inc.

Run File [QUIET.EXE]:   <return>
List File [NUL.MAP]:    <return>
Libraries [.LIB]:       <return>
Warning: No STACK segment

There was 1 error detected.
```

Figure 3. Screen output from LINK. Again, we simply pressed RETURN in answer to each of the options offered. By giving the optional files names other than NUL.MAP, we would have created these files on disk. At this point, we would identify any libraries we wanted to link to our program. See text for an explanation of the error.

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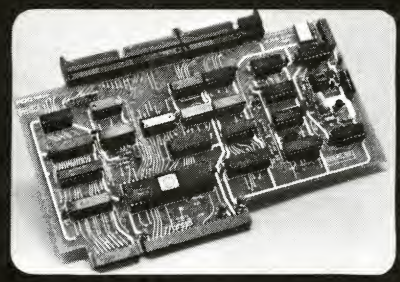

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but the object code module doesn't contain a statement allocating stack space in memory. For some programs this might be serious, but in our small program it doesn't make any difference and we can safely ignore it. I've left it here because when you run the Heath/Zenith examples, you'll get the same error. (The stack is used for temporary storage. For more on it, you might want to take a look at "Interrupt Programming Under HDOS," by Aaron Reynolds, in *Sextant* #4, Winter 1983.)

We now have a linked code file in an .EXE format, but we have to do one more thing before we can run QUIET. We need to convert the .EXE file to a .COM file. Like CP/M, Z–DOS recognizes .COM files as programs that can be run as. To convert our program, type this command line:

EXE2BIN QUIET.EXE.COM

Once this is completed, you will have the following four new files on your disk:

QUIET.ASM - the original source-code file.

QUIET.OBJ - the object-code file produced by MASM.

QUIET.EXE - the result of the LINK operation.

QUIET.COM - the file that can run on its own; produced by running EXE2BIN.

We can now test the results of our work by typing QUIET. There will be a brief disk access and the Z–DOS prompt should drop down a line. Now when you press a key, the key click will be silenced. Another success!

You might want to make note of the fact that we could have generated some other files as a result of our assembly work. You have the option of producing a listing of the assembled program (a .LST file) that is often useful for debugging and for retaining a record of the program.

You can run out a copy of this file on your printer; or view it on your screen by the command TYPE QUIET.LST. Listing 2 shows approximately what the first section of this file will look like. (You'll notice that the entire source code is present, including the comments. The unshaded portion to the right is the same as QUIET.ASM that you'll type into your computer. But if you look at the code itself, you'll see that it contains an .XLIST instruction—which turns off the list so that the .LST file won't include all the definitions referred to by the two following INCLUDE instructions. If you create the .LST file, these three lines won't appear.)

The shaded column contains numbers in hexadecimal notation (or "hex" for short). They're to the base 16, where the digits run from 0 to 9 and keep going from A to F. Thus A in hex is 10 decimal, F is 15, 10 hex is 16, and so on.

Among these figures are the numerical data that represent the mnemonic instructions you typed into the computer's memory and made into a source-code file. As you might guess, this is not yet what's referred to as machine language. As mentioned in the beginning, that's composed of binary numbers, ones and zeroes. (Then why the hexadecimal? One virtue for programmers is that a two-digit hex number is a lot easier to deal with than an eight-digit binary number.)

Besides giving the program itself, by the way, the .LST file will also give you the hex equivalents of the symbols used in Z-DOS assembly-language programming.

You can also generate a cross-reference file (a .CRF file) that can be used with the Z–DOS CREF utility to produce a sorted cross-reference listing of all the variables you used and where they appeared in the program. This is also useful for debugging, since it tells you all the references to the other files used by the INCLUDE statement. We won't list the contents of these files here because they're fairly long, but I encourage you to re-run the assembly procedure and generate all the optional files just to see what they look like.

Now that you have a working program, you may wish to have the computer run it whenever you first boot the system, without your having to type anything. Z-DOS has such a capability. It can process almost any instruction that it finds in a special file called AUTOEXEC.BAT. This is a "batch file" that can contain any command that you could type in from the keyboard. This means that if we created an AUTOEXEC.BAT file that contained the command QUIET, it would run our QUIET program upon boot-up. To do this, use your editor to create a one-line text file containing just the word QUIET. Save this file under the name AUTOEXEC.BAT. Now reboot your computer. When you press a key after the boot is complete, the key click will be off. (Note, though, that AUTOEXEC.BAT pushes aside the normal date and time queries you get upon booting up. If you wish to keep tabs on date and time, you have to add two more commands lines, DATE and TIME. Otherwise the boot routine will always record the default date and time—3-23-83 and 8:00 on my system.)

This is a simple example of how to create assembly language programs that do something useful which would be cumbersome or impossible to do any other way. It's probably occurred to you by now that you could do the same thing with any other escape code you might want to send.

Even this little program could be made to do a great many other things by sending different command lines to the computer terminal. So I'll leave it as an exercise to you to write a similar program that would turn the key-click feature back on.

Let's hope that after going through this procedure, assembly language programming on the H/Z100 computers won't seem such a formidable task.

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To get in touch with your fellow Heath/Zenith users, place your short notice in *Sextant*'s classified section. The rate is only 75¢ per word with a minimum of 15 words. Send your typewritten ad and payment to: *Sextant*, Classified Ad Department, 716 E Street S.E., Washington, DC 20003. (Please include your name and telephone number for our records.) We need to receive ads for the March-April, 1984 issue by January 4, 1984. If you have any questions, contact Sharon Conaway at 202/544–2868.

Luminaries

James Bingham works for Western Electric in Arizona. He's an electronics electrician working on microprocessor-controlled machinery—which may give him an edge on some of the rest of us when it comes to taking printers apart if anything goes wrong.

Steve Howard is the founder and past president of the St. Paul-Minneapolis Users Group—Heath (SMUGH). He's a Diagnostic Software Engineer for CPT Corporation. (Interesting title—considering that the Home Finance System was written by an M.D.)

Frank and Mary Lynn Hutchison live in Hawaii. He's a Lieutenant in the Navy overseeing ship construction; she's a free-lance writer. We don't know whether they've had the nerve to take Chris to see "Wargames." But we do know that anything they do with computer communications takes place only *after* the kids have gone to bed.

Hugh Kenner does not like it when BASIC tells him that the angles of an equilateral triangle are 59.9, 59.9, and 60.1 degrees. (Try building a geodesic dome with *that* geometry.)

Gordon W. Nichols is an electrical engineer with Electronic Data Systems in Arlington, Texas, and is active in the Fort Worth Heath Users' Group. We may hope that his printer holds up as long as his typewriter (which started work when Truman was still President).

Stephen C. Noeller is back with another sober, somber, serious look at the world around us.

Wayne Rash, Jr., usually works on the software side of the computer fence. He's a Lieutenant (j.g.) in the Navy working in data processing. (His review of dBASE II was in *Sextant* #7, Fall 1983.) But as his article here shows, he's not reluctant to pick up a soldering iron in order to save money on memory.

D. C. Shoemaker is on active duty in Europe. So let us take this opportunity to note that opinions expressed by folks in the Armed Forces do not necessarily represent the views of the Department of Defense. (Even though we don't think that Uncle Sam has any official position on silencing the 100's key click.)

Lynn Arthur Steen is Professor of Mathematics at St. Olaf College. So it's not surprising that he serves as an interface between computers and the liberal arts.

Kirk L. Thompson's last article was on hardware ("Automatic Key-Repeat for Your '19 or '89" in *Sextant* #6, Summer 1983). This time, he does an about-face and looks at CP/M. But some things don't change: he's still living in Iowa, with a four-hour trek to his Heath Users' Group meetings.

Philip C. Weinberg was circulation assistant here at *Sextant* until shortly after finishing his article in this issue. No, he didn't rush out to enlist. He just went back to school—Columbia University, for graduate study in Education.

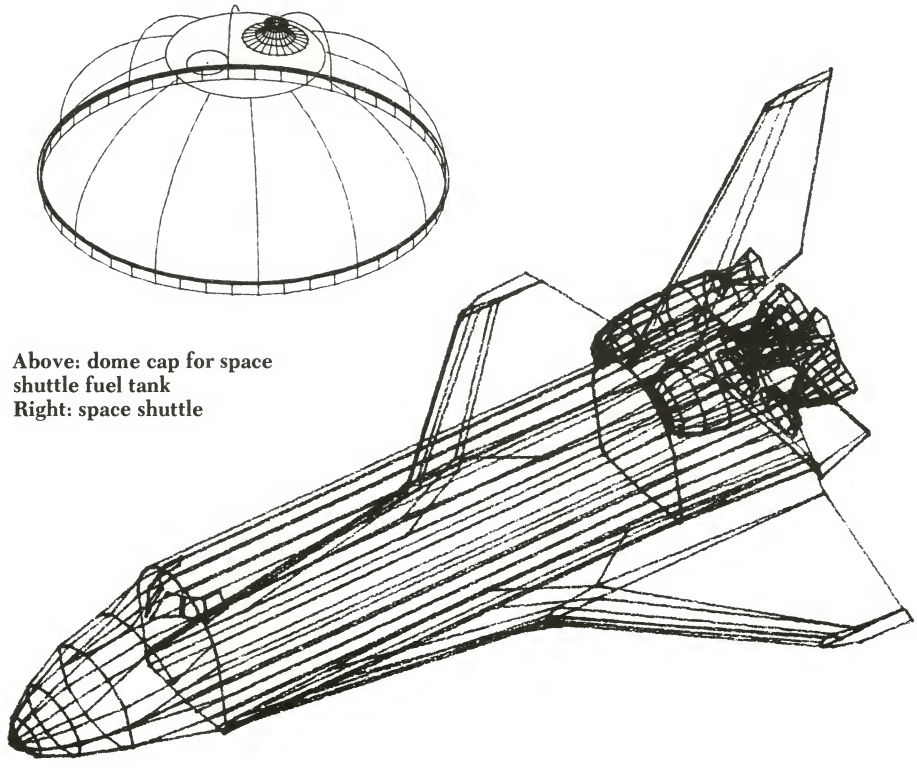
Supplier Notes

Engineers Can Do High-Level CAD/CAM on the Z100 with CADC

A sophisticated computer-aided design and drafting system is now available for the Z100 under Z-DOS. CADC has been produced by Computer Integrated Manufacturing Systems, Inc. (CIMS) (a reorganization of the former Far Field Software), with the help of over 100 specialists in engineering, design, and computer graphics. The package brings the capability of high-performance computer-aided design and computer-aided manufacture (CAD/CAM) into the price range of engineering students and small-scale design shops.

CIMS evaluated the graphics capabilities of several 16-bit microcomputers before choosing Zenith Data Systems' Z100 as the host machine for their software development. In the opinion of Bill Garner, owner of CIMS, "the Z100 had the best color resolution and potential software tools to develop a truly professional computer-aided design and computer-aided manufacture . . . system."

The CADC system has applications in most engineering fields, including mechanical, architectural, electrical, chemical, structural, mapping, and civil engineering. It allows the designer to create and edit full color, three-dimensional models of any scale or size, to save models on disk, to merge models into more complex assemblies, and to develop a library of models for future use. The designer can output designs to a plotter or printer/plotter at any time during the design process. CADC's basic geometric elements and sets include lines, points, circles, arcs, conics, splines, surfaces of revolution, projected entities, and mirroring of geometry.



Above: dome cap for space shuttle fuel tank
Right: space shuttle

CADC is composed of five major modes: Model Mode is used to create and edit the model or drawing; Properties Mode is used to add physical attributes to the model; Detail Mode is used to add dimensions and notes to the model or drawing; Plot Mode is used to plot the model or drawing; Space Frame is used to perform finite element analysis of the model.

The minimum configuration required to run the CADC system is: Z100 computer with color graphics; one floppy disk drive; 192K of memory; and Z-DOS. The recommended configuration is: Z100 with color graphics; one floppy and one Winchester disk drive; 192K of memory; Houston Instruments' HIPAD digitizer; Houston Instruments' DMP-29 or DMP-41 plotter; MX-80 or MX-100 printer; and Z-DOS.

CADC is priced as follows for individual programs: Model Mode: $995. Properties Mode: $195. Detail Mode: $295. Plot Mode: $195. Space Frame: $495. Sales tax will be added where applicable.

All five programs are available for $1,995, for a savings of $180. Model Mode and Space Frame can run independently of any of the other CADC modes, and may be purchased separately. The user who wants a system just to produce drawings need only purchase Model Mode, Detail Mode, and Plot Mode.

A demonstration disk of CADC Model Mode is available for $75. It has some limitations in data base structure, but all geometric entities can be demonstrated; it is sufficient to give the user a feeling of three-dimensional design. The $75 payment will be applied to any purchases of the actual system. Enclose $5 for shipping the demonstration disk. The disk is a 320K floppy.

Send all orders and inquiries to CIMS, Inc., 20859 Old Spanish Trail, New Orleans, LA 70129, 504/254–0545. Dealer inquiries are invited.

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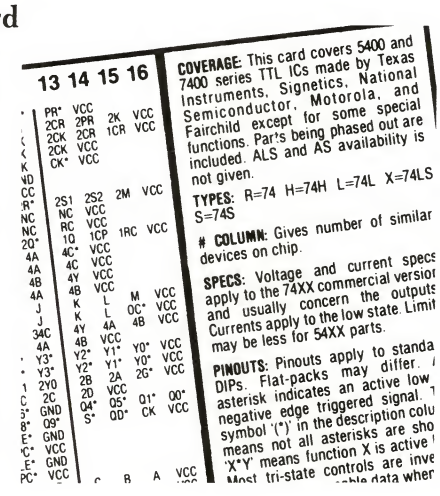
Micro Logic Corp. has made available pinout information for virtually all 54/7400 TTL ICs on a single time-saving card. Summarizing information found in 500-plus-page data books, Micro Chart® saves engineers and technicians time searching for key data. The two-sided, two-color full-page sheet is made of durable credit-card-type plastic with holes punched for a two- or three-ring binder. Each chart covers the part number, family type, description, and pinout in a compact tabular format. The cards are $5.95 each plus $1 postage per order from Micro Logic Corp., P.O. Box 174, 100 2nd Street, Hackensack, NJ 07602, 201/342–6518.


13 14 15 16
COVERAGE: This card covers 5400 and 7400 series TTL ICs made by Texas Instruments, Signetics, National Semiconductor, Motorola, and Fairchild except for some special functions. Parts being phased out are included. ALS and AS availability is not given.
TYPES: R=74 H=74H L=74L X=74LS S=74S
COLUMN: Gives number of similar devices on chip.
SPECS: Voltage and current specs apply to the 74XX commercial version and usually concern the outputs. Currents apply to the low state. Limits may be less for 54XX parts.
PINOUTS: Pinouts apply to standa DIPs. Flat-packs may differ.
asterisk indicates an active low
negative edge triggered signal.
symbol '(*)' in the description colu
means not all asterisks are sho
'X*Y' means function X is active
Most tri-state controls are inve

More Double-Precision Trig Functions

Hugh Kenner

In *Sextant* #3, Fall 1982, I passed along Microsoft BASIC double-precision routines for square root, sine, cosine, tangent, and arctangent.

Here are routines for arcsine and arccosine. Though relatively slow, they are optimized for speed. An input of 0.7 marks the point at which taking the complementary function of the complement starts being quicker; and that is exactly what these programs do. Thus 0.7 is the worst case and everything else is faster.

Arcsine

```
10 REM DOUBLE PRECISION ARCSIN
20 DEFDBL A,B,G,S,X,Y
30 INPUT "SINE";X
40 S=X
50 IF S>=.7 THEN X=(1-X*X):GOSUB 150
60 IF S<.7 THEN G=(3.141592653589793#/2)-X
70 N=1 : Y=X
80 N=N+1
90 Y=Y*X*X*((N*2)-3)/(((N*2)-2)*((N*2)-1))
100 IF S>=.7 THEN IF G=G+Y GOTO 130 ELSE G=G+Y
110 IF S<.7 THEN IF G=G-Y GOTO 130 ELSE G=G-Y
120 Y=Y*((N*2)-1) : GOTO 80
130 G=90-G*180/3.141592653589793#
140 PRINT "ANGLE=";G : GOTO 30
150 REM: DOUBLE PRECISION SQUARE ROOT
160 G=SQR(X) : A=G
170 B=((X-G*G)/(A+G))+G
180 IF A=B GOTO 200
190 A=B : GOTO 170
200 X=B : G=X
210 RETURN
```

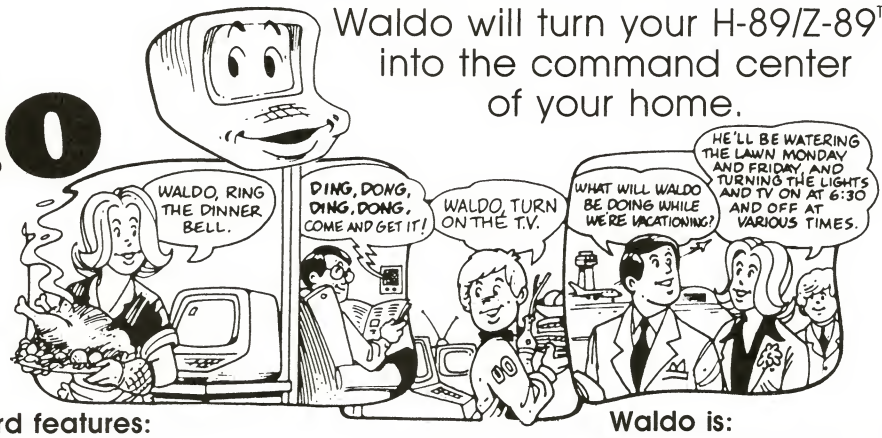
Arccosine

```
10 REM DOUBLE PRECISION ARCCOS
20 DEFDBL A,B,G,S,X,Y
30 INPUT "COSINE";X#
40 S=X
50 IF S>=.7 THEN X=(1-X*X):GOSUB 150
60 IF S<.7 THEN G=(3.141592653589793#/2)-X
70 N=1 : Y=X
80 N=N+1
90 Y=Y*X*X*((N*2)-3)/(((N*2)-2)*((N*2)-1))
100 IF S>=.7 THEN IF G=G+Y GOTO 130 ELSE G=G+Y
110 IF S<.7 THEN IF G=G-Y GOTO 130 ELSE G=G-Y
120 Y=Y*((N*2)-1) : GOTO 80
130 G=G*180/3.141592653589793#
140 PRINT "ANGLE=";G : GOTO 30
150 REM: DOUBLE PRECISION SQUARE ROOT
160 G=SQR(X) : A=G
170 B=((X-G*G)/(A+G))+G
180 IF A=B GOTO 200
190 A=B : GOTO 170
200 X=B : G=X
210 RETURN
```


Meet...

Waldo

Waldo will turn your H-89/Z-89™ into the command center of your home.


WALDO, RING THE DINNER BELL.
DING, DONG, DING, DONG, COME AND GET IT!
WALDO, TURN ON THE T.V.
WHAT WILL WALDO BE DOING WHILE WE'RE VACATIONING?
HE'LL BE WATERING THE LAWN MONDAY AND FRIDAY, AND TURNING THE LIGHTS AND TV ON AT 6:30 AND OFF AT VARIOUS TIMES.

The Voice-Activated Home Control System

Waldo has as standard features:

- voice recognition (Note: Waldo's speaking voice is optional)
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- BSR X-10 home control interface
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Waldo is:

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- a voice link between you and your computer
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☐ Waldo–main board with standard features. Circle CP/M or HDOS.	$399.00	$499.00
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☐ VOICEMOD-1-robot-type synthesized speech with unlimited vocabulary.	—	$249.00
☐ VOICEMOD-2-human quality speech with a 206-word vocabulary.	$199.00	$229.00
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Floppy Disk Services provides you with everything you need. That's two double-sided, double or single density, half height drives in either 48 or 96 tpi format, all hardware, cables and power connector adaptors. And most important, you get easy, step-by-step instructions, in the Heath/Zenith tradition of good, clear documentation.

We've thoroughly tested the TWOET/Heath set-up. Remember that a double sided 48 tpi will work perfectly as a single sided drive right out of the box! Hard or soft sectored—so you can even use this system with your H-17 controller. And of course we have the software drivers (additional cost) to run 48 or 96 tpi double sided, single density drives on the H-17.

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All hardware
Metal, shielded mounting plates
Data cable with chassis connector
Power 'Y' connector
Complete documentation
Price .... $595.00 complete

Model TWOET 465

2 Shugart SA-465 half height
96 tpi double sided
All hardware
Metal, shielded mounting plates
Data cable with chassis connector
Power 'Y' connector
Complete documentation
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Wondering what to do with your internal drive if you buy this system? Here's the solution. If you purchase a dual half height system for your Heath computer from Floppy Disk Services, just include an extra $60.00 plus shipping and receive a single 5¼ case with power supply *and* data cable ready to receive your SIEMENS internal drive! The case with data cable is normally a $75.00 item. And the cable that comes with your TWOET system includes the external chassis disk I/O connector.

Due to production deadlines, prices in this ad are 2 months old, so we encourage you to call us for current prices and new product info. Prices and specs subject to change without notice.

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Circle #117 on Reader Service Card

Scuttlebutt

Zenith has been doing very well selling Z100s to the **military-industrial complex.** They've made large group discount sales to the **TRW, Martin Marietta,** and **Boeing** employee users' groups. Moreover, Zenith has been awarded a contract by the **Air Force, Navy, and Marine Corps** to purchase a minimum of **6,000 Z100s** over the next three years. (For further information on the military purchase, see page 75.) Faced with such evidence that both their own technically sophisticated employees *and* their best customers prefer the Z100, perhaps the major aerospace companies will **get smart** and buy a few themselves.

In the September 5, 1983 issue of the *Detroit Free Press,* there was an article by Bob Schwabach of **Knight-Ridder Newspapers** comparing the IBM PC and the Z100. He began by saying: "Earlier this year the several hundred members of the Home Brew Computer Club met in Silicon Valley and voted on the best personal computer you could lay your hands on. They picked IBM and Zenith." (If that news item sounds familiar, maybe it's because we reported it in this department in *Sextant* #6.)

Schwabach describes the IBM PC and its success in the marketplace, then continues:

> Of course, IBM does not make much more than the initials. Almost everything else was made by somebody else.
>
> . . . The problem is not the machine, which is fine, but the price.
>
> . . . The Zenith gives you more hardware power and the IBM more software power. If the price were the same it would make sense to 'play it safe' and go with IBM. But the price isn't the same, and for someone who wants a high-powered professional machine, it's hard to beat what Zenith is offering.
>
> . . . Few people get a chance to work on both machines. I talked with one, a programmer at Peachtree Software, who has to. Peachtree makes a really fine program called PeachText 5000 that combines word processing, a spreadsheet, and a filing system, and runs on both IBM and Zenith. He said that after months with both he preferred the Zenith.

William F. Buckley mentions in the acknowledgements to his latest book, *Overdrive,* that it was typed on a Z90 using The Software Toolworks' PIE and TEXT.

When **Osborne** Computer Corporation filed for bankruptcy in September, it had a **$700,000 debt** to Zenith Radio Corporation, which had been supplying 5" screens for the Osborne 1.

A Zenith Data Systems representative told *Sextant* that ZDS is spending an average of **4–6% of sales** on advertising. Advertising Manager Bob Winter explained that ZDS does not have a fixed lump sum budget figure to spend each year. ZDS uses a "task method," which means they look at each possible advertising investment on a case-by-case basis. Of course, Winter said, "We do have certain ceilings."

In the September 1983 issue of *Microsystems,* there's an article by David Bray in which he describes **how to upgrade a 2 MHz S-100 bus computer** to incorporate a CompuPro 8085/8088 dual processor board. (He uses his IMSAI 8080 as an example.) The end result of that project sounds very similar to the Z100, which also uses the S-100 bus and Intel's 8085 and 8088 central processor units. So it's interesting to note that Bray is Dean of Educational Computing Services at Clarkson College, where every member of the entering freshman class gets a Z100 at the group discount price of $200 a semester.

A sixth graduate of **Swarthmore College** has joined the *Sextant* staff. English major **Martha Swain** graduated with Distinction on May 30. She's starting as a production assistant.

And **John Gill,** a graduate of Columbia University, has also joined us, replacing Phil Weinberg as circulation assistant. Phil will be pursuing graduate studies at the Teachers College at Columbia. (The start of a Columbia University/*Sextant* circulation assistant exchange program?)

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System requirements: HDOS 2.0, 64K (32K), H8/H89, and Line Printer for PLOT output.*
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Use all existing Heath/Zenith H89/Z90 software and hardware products.

Benefit from CP/M®, CP/M Plus®, MP/M II® or HDOS operating systems, providing *incomparable* application software resources.

Expand your computing power with 128K byte RAM; up to 256K bytes optional (with parity checking).

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ontact your local Heathkit Electronic Center, or DG Electronic Developments for further information.

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In short, it's an 80-page plain-English, graphically stunning, pocket-sized definitive guide to the care and feeding of flexible disks.

For The Book, ask your nearest computer store that sells Elephant™ disks, and bring along one and one half earth dollars.

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